



## DEPARTMENT OF ENERGY

### 10 CFR Part 430

[EERE-2019-BT-TP-0026]

RIN 1904-AE60

#### **Energy Conservation Program: Test Procedure for Dehumidifiers**

**AGENCY:** Office of Energy Efficiency and Renewable Energy, Department of Energy.

**ACTION:** Final rule.

**SUMMARY:** The U.S. Department of Energy (“DOE”) is amending its test procedure for dehumidifiers to reference the current version of an applicable industry standard; change the rating test period to be two hours; permit the use of sampling trees in conjunction with an aspirating psychrometer or relative humidity sensor; and provide additional specification for testing dehumidifiers with network capabilities. This rulemaking fulfills DOE’s obligation to review its test procedures for covered products at least once every seven years.

**DATES:** The effective date of this rule is [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]. The amendments will be mandatory for product testing starting [INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*].

The incorporation by reference of certain material listed in this rule is approved by the Director of the Federal Register on [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]. The incorporation by reference of certain other materials listed in this rule were approved by the Director of the Federal Register as of April 6, 2012 and August 31, 2015.

**ADDRESSES:** The docket, which includes *Federal Register* notices, public meeting attendee lists and transcripts, comments, and other supporting documents/materials, is

available for review at *www.regulations.gov*. All documents in the docket are listed in the *www.regulations.gov* index. However, not all documents listed in the index may be publicly available, such as those containing information that is exempt from public disclosure.

A link to the docket webpage can be found at *www.regulations.gov/docket/EERE-2019-BT-TP-0026*. The docket webpage contains instructions on how to access all documents, including public comments, in the docket.

For further information on how to review the docket contact the Appliance and Equipment Standards Program staff at (202) 287-1445 or by email: *ApplianceStandardsQuestions@ee.doe.gov*.

**FOR FURTHER INFORMATION CONTACT:**

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**SUPPLEMENTARY INFORMATION:**

DOE maintains previously approved incorporations by reference and incorporates by reference the following industry standard into part 430:

AHAM Standard DH-1-2022, Energy Measurement Test Procedure for Dehumidifiers, copyright 2022 (“AHAM DH-1-2022”).

A copy of AHAM DH-1-2022 can be obtained from the Association of Home Appliance Manufacturers (“AHAM”), 1111 19th Street NW, Suite 402, Washington, DC 20036, (202) 872-5955; or [www.aham.org](http://www.aham.org).

For a further discussion of this standard, see section IV.N of this document.

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## V. Approval of the Office of the Secretary

### I. Authority and Background

Dehumidifiers are included in the list of “covered products” for which DOE is authorized to establish and amend energy conservation standards and test procedures. (42 U.S.C. 6293(b)(13); 42 U.S.C. 6295(cc)) DOE’s energy conservation standards and test procedures for dehumidifiers are currently prescribed at 10 CFR 430.32(v); and 10 CFR part 430, subpart B, appendix X (“appendix X”) and appendix X1 (“appendix X1”), respectively. The following sections discuss DOE’s authority to establish test procedures for dehumidifiers and relevant background information regarding DOE’s consideration of test procedures for this product.

#### *A. Authority*

The Energy Policy and Conservation Act, Pub. L. 94-163, as amended (“EPCA”),<sup>1</sup> authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part B of EPCA<sup>2</sup> established the Energy Conservation Program for Consumer Products Other Than Automobiles, which sets forth a variety of provisions designed to improve energy efficiency. These products include dehumidifiers, the subject of this document. (42 U.S.C. 6291(34); 42 U.S.C. 6293(b)(13); 42 U.S.C. 6295(cc))

The energy conservation program under EPCA consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification

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<sup>1</sup> All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Pub. L. 116-260 (Dec. 27, 2020), which reflect the last statutory amendments that impact Parts A and A-1 of EPCA.

<sup>2</sup> For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.

and enforcement procedures. Relevant provisions of EPCA specifically include definitions (42 U.S.C. 6291), test procedures (42 U.S.C. 6293), labeling provisions (42 U.S.C. 6294), energy conservation standards (42 U.S.C. 6295), and the authority to require information and reports from manufacturers (42 U.S.C. 6296).

The testing requirements consist of test procedures that manufacturers of covered products must use as the basis for (1) certifying to DOE that their products comply with the applicable energy conservation standards adopted under EPCA (42 U.S.C. 6295(s)), and (2) making other representations about the efficiency of those products (42 U.S.C. 6293(c)). Similarly, DOE must use these test procedures to determine whether the products comply with any relevant standards promulgated under EPCA. (42 U.S.C. 6295(s))

Federal energy efficiency requirements for covered products established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6297) DOE may, however, grant waivers of Federal preemption for particular State laws or regulations, in accordance with the procedures and other provisions of EPCA. (42 U.S.C. 6297(d))

Under 42 U.S.C. 6293, EPCA sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered products. EPCA requires that any test procedures prescribed or amended under this section shall be reasonably designed to produce test results which measure energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative average use cycle (as determined by the Secretary) or period of use and shall not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered product, including dehumidifiers, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle or period of use. (42 U.S.C. 6293(b)(1)(A))

If the Secretary determines, on her own behalf or in response to a petition by any interested person, that a test procedure should be prescribed or amended, the Secretary shall promptly publish in the *Federal Register* proposed test procedures and afford interested persons an opportunity to present oral and written data, views, and arguments with respect to such procedures. The comment period on a proposed rule to amend a test procedure shall be at least 60 days and may not exceed 270 days. In prescribing or amending a test procedure, the Secretary shall take into account such information as the Secretary determines relevant to such procedure, including technological developments relating to energy use or energy efficiency of the type (or class) of covered products involved. (42 U.S.C. 6293(b)(2)) If DOE determines that test procedure revisions are not appropriate, DOE must publish its determination not to amend the test procedures. (42 U.S.C. 6293(b)(1)(A)(ii))

In addition, EPCA requires that DOE amend its test procedures for all covered products to integrate measures of standby mode and off mode energy consumption into the overall energy efficiency, energy consumption, or other energy descriptor, unless the current test procedure already incorporates the standby mode and off mode energy consumption, or if such integration is technically infeasible. (42 U.S.C. 6295(gg)(2)(A))

If an integrated test procedure is technically infeasible, DOE must prescribe separate standby mode and off mode energy use test procedures for the covered product, if a separate test is technically feasible. *Id.* Any such amendment must consider the most current versions of the IEC 62301<sup>3</sup> and IEC Standard 62087<sup>4</sup> as applicable. *Id.*

DOE is publishing this final rule in satisfaction of the 7-year review requirement specified in EPCA. (42 U.S.C. 6293(b)(1)(A))

### *B. Background*

DOE last amended the test procedure for dehumidifiers at appendix X on July 31, 2015 (“July 2015 Final Rule”), to provide technical clarifications and improve repeatability of the test procedure. 80 FR 45801. The July 2015 Final Rule also established a new test procedure for dehumidifiers at appendix X1 that, among other things, changed the test conditions for portable dehumidifiers and established separate provisions for testing whole-home dehumidifiers. *Id.* Manufacturers were not required to use appendix X1 until the compliance date of a subsequent amendment to the energy conservation standards for dehumidifiers. On June 13, 2016, DOE published a final rule establishing amended energy conservation standards for dehumidifiers, for which compliance, and the use of appendix X1, was required beginning June 13, 2019. 81 FR 38337.

On June 30, 2021, DOE published in the *Federal Register* an early assessment review request for information (“June 2021 RFI”) in which it sought data and information regarding issues pertinent to whether an amended test procedure would more accurately or fully comply with the requirement that the test procedure produces results that measure

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<sup>3</sup> IEC 62301, *Household electrical appliances—Measurement of standby power* (Edition 2.0, 2011-01).

<sup>4</sup> IEC 62087, *Audio, video and related equipment—Methods of measurement for power consumption* (Edition 1.0, Parts 1–6: 2015, Part 7: 2018).

energy use during a representative average use cycle for the product without being unduly burdensome to conduct. 86 FR 34640. DOE also requested comments on specific topics relevant to the proposed dehumidifier test procedure, including updates to industry test standards, variable-speed dehumidifiers, psychrometer setup, network functions, and ventilation air for whole-home dehumidifiers. *Id.*

On June 9, 2022, DOE published in the *Federal Register* a notice of proposed rulemaking (“June 2022 NOPR”) proposing to reference the current version of an applicable industry standard, allow the rating test period to be two or six hours, permit the use of a sampling tree in conjunction with an aspirating psychrometer or relative humidity sensor, and specify for dehumidifiers with network capabilities that all network functions must be disabled throughout testing. DOE requested comments from interested parties on the proposal. 87 FR 35286. DOE held a public meeting related to the June 2022 NOPR on July 12, 2022.

In response to the June 2022 NOPR, DOE received comments from the interested parties listed in Table II.1.



**Table II.1 List of Commenters with Written Submissions in Response to the June 2022 NOPR**

<b>Commenter(s)</b>	<b>Reference in this Final Rule</b>	<b>Comment No. in the Docket</b>	<b>Commenter Type</b>
Anonymous	Anonymous	12	Individual
Intertek Laboratories	Intertek	13	Test Laboratory
Aprilaire, a division of Research Products Corporation	Aprilaire	14	Manufacturer
Madison Indoor Air Quality	MIAQ	15	Manufacturer
GE Appliances	GEA	16	Manufacturer
Association of Home Appliance Manufacturers	AHAM	17	Trade Association
Appliance Standards Awareness Project, American Council for an Energy-Efficient Economy, Consumer Federation of America, Natural Resources Defense Council, Northwest Energy Efficiency Alliance	Joint Commenters	18	Efficiency Organizations

A parenthetical reference at the end of a comment quotation or paraphrase provides the location of the item in the public record.<sup>5</sup> To the extent that interested parties have provided written comments that are substantively consistent with any oral comments provided during the July 12, 2022 public meeting, DOE cites the written comments throughout this final rule. Any oral comments provided during the webinar that are not substantively addressed by written comments are summarized and cited separately throughout this final rule.

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<sup>5</sup> The parenthetical reference provides a reference for information located in the docket of DOE's rulemaking to develop test procedures for dehumidifiers. (Docket No. EERE-2019-BT-TP-0026, which is maintained at [www.regulations.gov](http://www.regulations.gov)). The references are arranged as follows: (commenter name, comment docket ID number, page of that document).

## II. Synopsis of the Final Rule

In this final rule, DOE amends the test procedures for dehumidifiers as follows:

- 1) Incorporate by reference the most recent version of the relevant industry test procedure, AHAM DH-1-2022, “Energy Measurement Test Procedure for Dehumidifiers”;
- 2) Amend the definitions at 10 CFR 430.2 for “portable dehumidifier” and “whole-home dehumidifier” to reference the manufacturer instructions available to a consumer as they relate to the ducting configuration and installation;
- 3) Change the rating test period in sections 4.1.1, 4.1.2, and 5.4 of appendix X1 to 2 hours;
- 4) Add a provision in section 3.1.1.2 of appendix X1 allowing for the use of a sampling tree for all dehumidifier tests; and
- 5) Add a requirement in section 3.1.2.4 of appendix X1 that dehumidifiers be tested in accordance with Section 5.5 of AHAM DH-1-2022, including with the network functions in the “off” position if it can be disabled by the end-user; otherwise test in the factory default setting.
- 6) Remove appendix X and references to appendix X at 10 CFR 430.3 and 10 CFR 430.23.

The adopted amendments are summarized in Table II.1 compared to the test procedure provision prior to the amendment, as well as the reason for the adopted change.

**Table II.1 Summary of Changes in the Amended Test Procedure**

<b>DOE Test Procedure Prior to the Amendment</b>	<b>Amended Test Procedure</b>	<b>Attribution</b>
Incorporates by reference ANSI/AHAM DH-1-2008.	Incorporates by reference AHAM DH-1-2022.	Updated industry test method.
Defines “portable dehumidifier” and “whole-home dehumidifier” based on design intent.	Defines “portable dehumidifier” and “whole-home dehumidifier” by reference to the manufacturer instructions and operational capabilities.	Improve clarity of definitions to provide added specificity to product definitions.
Does not allow for the use of a sampling tree for a dehumidifier with a single process air intake grille.	Adds provision to allow for the use of a sampling tree for all tests.	Improve test procedure repeatability and reproducibility.
Specifies a test period of 6 hours for dehumidification mode.	Specifies a test period of 2 hours for dehumidification mode.	Reduce test burden while maintaining representativeness.
Does not explicitly address dehumidifiers with network functions.	Adds a requirement to test dehumidifiers that offer network functions with the network functions in the “off” position if it can be disabled by the end-user; otherwise test in the factory default setting.	Ensure test procedure reproducibility.
Subpart B contains appendix X and appendix X1.	Removes appendix X.	Remove obsolete test procedure.
10 CFR 430.3 includes materials incorporated by reference for appendix X.	Removes materials incorporated by reference for appendix X.	Remove obsolete test procedure references.
10 CFR 430.23(z) specifies instructions for determining capacity and efficiency using appendix X or appendix X1.	Removes appendix X instructions at 10 CFR 430.23(z).	Remove obsolete test procedure references.

DOE has determined that the amendments described in section III of this document and adopted in this document will not alter the measured efficiency of dehumidifiers or require retesting or recertification solely as a result of DOE’s adoption of the amendments to the test procedures. Additionally, DOE has determined that the amendments will not increase the cost of testing. DOE’s actions are addressed in detail in section III of this document.

The effective date for the amended test procedures adopted in this final rule is 30 days after publication of this document in the *Federal Register*. Representations of energy use or energy efficiency must be based on testing in accordance with the amended test procedures beginning 180 days after the publication of this final rule.

### **III. Discussion**

In the following sections, DOE provides certain amendments to its test procedures for dehumidifiers. For each amendment, DOE provides relevant background information and discusses relevant public comments.

#### *A. General Comments*

In response to the June 2022 NOPR, DOE received the following general comments regarding the proposed changes to the test procedure.

According to an anonymous commenter, the amended test procedure should require the same level of rigor as the current one. (Anonymous, No. 12 at p.1)

DOE has evaluated the changes to the test procedure adopted in this rulemaking and determined that they will not adversely affect test procedure representativeness or reproducibility and will not be unduly burdensome to conduct.

AHAM stated that the overlapping comment periods for this test procedure rulemaking and the preliminary technical support document from the dehumidifier energy conservation standards rulemaking posed a challenge to manufacturers seeking to evaluate both documents. AHAM stated that DOE should fully receive stakeholder comments on the test procedure before proceeding with the energy conservation

standards rulemaking. AHAM commented that the current process diminishes the value of stakeholder engagement early in the process. (AHAM, No. 17 at pp. 4–5)

MIAQ supported the finalization of changes to the test procedure before undertaking a new standards rulemaking. (MIAQ, No. 15 at p. 10)

Section 8(d)(1) of appendix A to 10 CFR part 430, subpart C (“appendix A”) generally provides that new test procedures and amended test procedures that impact measured energy use or efficiency will be finalized at least 180 days prior to the close of the comment period for a NOPR proposing new or amended energy conservation standards. DOE will continue to conduct additional analyses based on this finalized test procedure before proposing any new energy conservation standards, and stakeholders will be provided an opportunity to comment on any updated analysis as part of any proposal published regarding new or amended standards.

#### *B. Scope of Applicability*

EPCA defines a dehumidifier as a self-contained, electrically operated, and mechanically encased assembly consisting of (1) a refrigerated surface (evaporator) that condenses moisture from the atmosphere; (2) a refrigerating system, including an electric motor; (3) an air-circulating fan; and (4) a means for collecting or disposing of the condensate. (42 U.S.C. 6291(34)) In the July 2015 Final Rule, DOE codified a regulatory definition of “dehumidifier” that clarified the definition by excluding products that may provide condensate removal or latent heat removal as a secondary function. 80 FR 45801, 45805. DOE, therefore, adopted a definition that explicitly excluded portable air conditioners, room air conditioners, and packaged terminal air conditioners, because

these are products that may provide condensate removal or latent heat removal as a secondary function.

Consumer products meeting the definition of “dehumidifier” as codified at 10 CFR 430.2 are subject to DOE’s regulations for testing, certifying, and complying with energy conservation standards.

In the July 2015 Final Rule, DOE established definitions for two groups of dehumidifiers: “portable dehumidifiers” and “whole-home dehumidifiers.” 80 FR 45801, 45805. A “portable dehumidifier” is a dehumidifier designed to operate within the dehumidified space without ducting (although means may be provided for optional duct attachment). 10 CFR 430.2. A “whole-home dehumidifier” is a dehumidifier designed to be installed with ducting to deliver return process air to its inlet and dehumidified process air to one or more locations in the dehumidified space. *Id.* The July 2015 Final Rule also established a definition for “refrigerant-desiccant dehumidifier” to mean a whole-home dehumidifier that removes moisture from the process air by means of a desiccant material in addition to a refrigeration system. *Id.*

## 1. Dehumidifier Configuration Definitions

As stated, a whole-home dehumidifier is designed to be *installed with ducting* while a portable dehumidifier is designed to operate *without the attachment of additional ducting*, although a means may be provided for optional duct attachment [emphasis added]. In the June 2022 NOPR, DOE stated that the “designed to” wording in these definitions may imply that DOE makes subjective determinations about how a dehumidifier is categorized, which may lead to confusion. 87 FR 35286, 35291. DOE

proposed to amend the portable dehumidifier and whole-home dehumidifier definitions to instead reference manufacturer instructions available to a consumer as they relate to the ducting configuration. *Id.* Specifically, DOE proposed to define a portable dehumidifier as a dehumidifier that, in accordance with any manufacturer instructions available to a consumer, operates within the dehumidified space without the attachment of additional ducting, although means may be provided for optional duct attachment. *Id.* DOE proposed to define a whole-home dehumidifier as a dehumidifier that, in accordance with any manufacturer instructions available to a consumer, operates with ducting to deliver return process air to its inlet and to supply dehumidified process air from its outlet to one or more locations in the dehumidified space. *Id.* DOE also proposed not to delineate a definition for “crawlspaces dehumidifiers,” as suggested by commenters, because of concerns that such a definition would not only reduce regulatory transparency but also create challenges for enforcement. *Id.*

The anonymous commenter supported the use of clear product categories for dehumidifiers and specifically supported DOE’s decision not to create a “crawlspaces dehumidifier” definition. The commenter stated that new dehumidifier definitions that do not represent true differences between units could lead to new retail price tiers, which would negatively affect the secondary market. (Anonymous, No. 12 at p. 1)

MIAQ proposed that DOE change the configuration names from portable dehumidifier and whole-home dehumidifier to “ductless dehumidifier” and “ducted dehumidifier,” respectively. MIAQ stated that these changes to the definition would reduce market and regulatory confusion and result in more units being tested using the most representative conditions. MIAQ commented that its proposed “ductless” definition would eliminate confusion around dehumidifiers intended for crawlspaces use, as these units meet the DOE definition of a portable dehumidifier because manufacturers provide instructions for operation without ducting, but industry stakeholders consider the units to

be different from portable dehumidifiers because they are often hung from joists or placed in inaccessible areas. (MIAQ, No. 15 at pp. 2–3)

DOE notes that the currently applicable definition in 10 CFR 430.2, as well as the definition proposed in the June 2022 NOPR and finalized in this final rule, for “portable dehumidifier” expressly states that such a dehumidifier is designed to operate within the dehumidified space without ducting (although means may be provided for optional duct attachment), thereby providing as much clarity in determining product classification on the basis of duct configuration as would MIAQ’s proposed term “ductless dehumidifier.” Similarly, the definition of “whole-home dehumidifier” states that it is designed to be installed with ducting (*i.e.*, is a “ducted dehumidifier”). Further, the “portable” and “whole-home” dehumidifier categories are widely known and used in industry and are the basis of the current DOE energy conservation standards. Additionally, the installation circumstances of portable dehumidifiers mounted between joists do not in themselves necessitate a change in test approach, as the portable dehumidifier test conditions and test setup are representative of typical conditions encountered by dehumidifiers without installed ducting. For these reasons, DOE is maintaining the current nomenclature of “whole-home” and “portable” dehumidifiers in this final rule.

MIAQ also suggested that DOE remove the words “to deliver return process air to its inlet and” from the whole-home dehumidifier definition because whole-home dehumidifiers may be installed such that they draw air from a single space, such as a basement or hallway, rather than from the heating, ventilation, and air conditioning (“HVAC”) return air supply. MIAQ said that if DOE removed “to deliver return process air to its inlet and” from the whole-home dehumidifier definition, it would suggest that some whole-home dehumidifiers typically operate with inlet air conditions of 65 degrees Fahrenheit (“°F”) and 60 percent relative humidity. (MIAQ, No. 15 at pp. 3–4)



DOE recognizes that whole-home dehumidifiers may be installed in various ducting configurations, as specified by manufacturers. These include installation with inlet ducting connected to the HVAC supply, as well as other sources of return air, (e.g., return air from a centrally located area of the structure, as identified by MIAQ in their comment), or other areas. DOE notes that whole-home dehumidifier configurations that include ducting from either the HVAC return or from other central locations in the dwelling both meet the existing whole-home dehumidifier definition, as these units “operate with ducting” to collect return process air and supply dehumidified process air from its outlet. As discussed in the June 2015 Final Rule, DOE considers an inlet air temperature of 73 °F, representing a whole-home dehumidifier ducted to an HVAC return air supply, to be the most representative test configuration for whole-home dehumidifiers. 80 FR 45802, 45811. In this way, DOE’s whole-home dehumidifier test procedure determines performance in the most representative configuration and with the most representative test conditions. Therefore, in this final rule, DOE is making no further amendments to the whole-home dehumidifier definition beyond those proposed in the June 2022 NOPR and discussed previously.

## 2. Non-Residential Dehumidifiers

In the June 2022 NOPR, DOE responded to comments suggesting that DOE clarify how the current dehumidifier definitions apply to non-residential dehumidifiers, such as horticultural dehumidifiers. 87 FR 35286, 35291. With respect to horticultural dehumidifiers and other dehumidifiers marketed for non-residential applications, DOE noted that dehumidifiers are “consumer products.” *Id.* EPCA defines a “consumer product” as any article (other than an automobile, as defined in section 32901(a)(3) of title 49) of a type (A) which in operation consumes, or is designed to consume, energy or, with respect to showerheads, faucets, water closets, and urinals, water; and (B) which, to any significant extent, is distributed in commerce for personal use or consumption by

individuals; without regard to whether such article of such type is in fact distributed in commerce for personal use or consumption by an individual. (42 U.S.C. 6291(1))

Accordingly, DOE stated in the June 2022 NOPR that to the extent that a dehumidifier model is of a type distributed in commerce for personal use or use by an individual, it would be within the scope of the dehumidifier test procedure, regardless of how they are marketed and whether they are distributed for personal or individual use. 87 FR 35286, 35291.

MIAQ also commented that the use of “portable” in the “portable dehumidifier” definition could lead to confusion regarding the applicability of appendix X1 to fire and flood remediation dehumidifiers, which are portable but not intended for consumer use. Further, MIAQ stated that changing the name of “whole-home dehumidifiers” to “ducted dehumidifiers” would clearly indicate that this product category is intended to be ducted dehumidifier whether that unit is ducted into a home, apartment, or light commercial space or any other space units in the product category can be found. (MIAQ, No. 15 at pp. 2–3)

In response to MIAQ, DOE reiterates its discussion from the June 2022 NOPR that with respect to dehumidifiers marketed for non-residential applications, such as horticultural, flood and fire remediation, and light commercial uses, to the extent that a dehumidifier model is of a type that is, to any significant extent, distributed in commerce for personal use or use by an individual, it would meet the definition of “dehumidifier” and would be within the scope of the dehumidifier test procedure in accordance with the definition of a consumer product in 42 U.S.C. 6291(1)(B), regardless of how it is marketed and whether the model is distributed for personal or individual use. To the extent that dehumidifiers marketed for non-residential applications do not meet the definition of consumer product, such as dehumidifiers that are connected exclusively to three-phase power that is not present in U.S. households, they are excluded from the

DOE test procedure. DOE has not received any information from commenters about specific features or designs that would differentiate horticultural, fire and flood remediation, or non-residential dehumidifiers from those within the scope of the DOE test procedure. DOE has published guidance on making “of a type” determinations at [www.energy.gov/gc/enforcement-policies-and-statements](http://www.energy.gov/gc/enforcement-policies-and-statements), “Guidance Concerning Consumer/Commercial Distinction.” A manufacturer may submit a petition to waive any test procedure requirements if it believes that its dehumidifier contains one or more design characteristics that either (1) prevent testing of the basic model according to the prescribed test procedure; or (2) cause the prescribed test procedure to evaluate the dehumidifier in a manner so unrepresentative of its true energy and/or water consumption characteristics as to provide materially inaccurate comparative data. 10 CFR 430.27(a). The petition should suggest an alternative method for testing the basic models identified in the waiver. 10 CFR 430.27(b)(1)(iii).

### 3. Dehumidifiers with External Heat Rejection

In the June 2022 NOPR, DOE responded to a comment from MIAQ suggesting that DOE consider a definition that includes dehumidifiers with external heat rejection, which MIAQ described as units that provide cool, dry air as an air conditioner does, except that the focus is on obtaining the proper level of dehumidification first, and cooling is a by-product of the process. 87 FR 35286, 35290. In response, DOE explained that the primary function of an air conditioner is to provide cooling by removing both sensible and latent heat, whereas a dehumidifier is intended to remove only latent heat. *Id.* Accordingly, portable air conditioners, room air conditioners, and packaged terminal air conditioners are explicitly excluded in the existing definition of “dehumidifier.” These explicit exclusions include the unitary air conditioning products of concern to MIAQ. *Id.* Any other non-dehumidifier product on the market that would meet the definition of “dehumidifier” is already explicitly excluded. *Id.* Accordingly, DOE tentatively

determined that the explicit exclusions in the regulatory definition of dehumidifier already address MIAQ's concern and therefore did not propose to add any such exclusions to the dehumidifier definition. *Id.*

In response to the June 2022 NOPR, MIAQ recommended that DOE revise the dehumidifier definition by replacing the wording “that is self-contained” with “that is predominately intended to remove latent heat.” MIAQ commented that this change would acknowledge that there are dehumidifiers that include external heat rejection with an outdoor condenser and that these products provide cooling but, because their primary purpose is dehumidification, they should be considered dehumidifiers. MIAQ asserted that adding this phrase to the dehumidifier definition would clarify that units with a primary function of dehumidification should be certified as dehumidifiers. (MIAQ, No. 15 at p. 2)

Following a review of the market, DOE is not aware of any residential dehumidifiers on the market that are not self-contained. With respect to latent heat removal, DOE reiterates its discussion from the June 2022 NOPR that the primary function of an air conditioner is to provide cooling by removing both sensible and latent heat, whereas a dehumidifier is intended to remove only latent heat. 87 FR 35286, 35290. The dehumidifier definition explicitly excludes portable air conditioners, room air conditioners, and packaged terminal air conditioners to ensure that other non-dehumidifier products on the market that would meet the definition of “dehumidifier” but primarily provide cooling, do not meet the definition. These explicit exclusions limit the dehumidifier definition to units that primarily remove latent heat, instead of both sensible and latent heat. Accordingly, DOE has determined that the explicit exclusions in the regulatory definition of dehumidifier found in 10 CFR 430.2 already address MIAQ’s concern. Therefore, DOE is not adding exclusions to the dehumidifier definition in this final rule.

### *C. Test Procedure*

Dehumidifiers are currently tested in accordance with appendix X1, which adopts certain text provisions from ANSI/AHAM DH-1-2008, with modification. In part, the DOE test procedure specifies a different dry-bulb temperature (65 °F for portable dehumidifiers and 73 °F for whole-home dehumidifiers) than ANSI/AHAM DH-1-2008, while still maintaining the relative humidity specified by ANSI/AHAM DH-1-2008, and specifies provisions for inactive, off-cycle, and off mode testing. *See* sections 4.1.1 and 3.2 of appendix X1. Appendix X1 also includes instructions regarding instrumentation, condensate collection, control settings, setup, and ducting for whole-home dehumidifiers. *See* sections 3.1.2.2; 3.1.1.4; 3.1.1.5; 3.1.1.1; and 3.1.3 of appendix X1.

Under the current test procedure, a unit's capacity is the volume of water, in pints, the unit removes from the ambient air per day, normalized to a standard ambient temperature and relative humidity. *See* section 2.14 of appendix X1. The integrated energy factor ("IEF"), representing the efficiency of the unit expressed in liters per kilowatt-hour, is the ratio between the capacity and the combined amount of energy consumed by the unit in dehumidification mode and standby and/or off mode(s), adjusted for the representative number of hours per year spent in each mode. *See* section 5.4 of appendix X1.

#### 1. Relevant Industry Standard

Intertek recommended that the DOE test procedure reference ANSI/American Society of Heating, Refrigerating and Air-Conditioning Engineers ("ASHRAE") 37 rather than ANSI/AMCA 210, as Intertek believes that ANSI/ASHRAE 37 is more appropriate and accurate for dehumidifiers. (Intertek, No. 13 at p. 1)

DOE has reviewed ANSI/ASHRAE 37-2009 (reaffirmed in 2019) and found it to be largely consistent with the requirements from ANSI/AMCA 210, used in appendix X1. DOE was not able to identify provisions in ANSI/ASHRAE 37 that would improve the representativeness or reproducibility of the whole-home dehumidifier test procedure, and Intertek did not identify which provisions in ANSI/ASHRAE 37 are more appropriate for the test procedure. Without additional information and given the overall general consistency between the two standards, DOE is maintaining ANSI/AMCA 210 as the test standard referenced in appendix X1 for whole-home dehumidifiers.

## 2. Updates to Industry Standards

As discussed, the dehumidifier test procedure at appendix X1 references ANSI/AHAM DH-1-2008, an industry test procedure for dehumidifiers, with modification. While ANSI/AHAM DH-1-2008 provides instructions for testing portable dehumidifiers, appendix X1 also references ANSI/AHAM DH-1-2008 when specifying test setup and instrumentation requirements for whole-home dehumidifiers. In 2017, AHAM published a revision to AHAM DH-1, (*i.e.*, AHAM DH-1-2017), which established provisions for testing dehumidifier energy use in off-cycle, inactive, and off modes, and for including energy consumption in those modes in efficiency calculations. AHAM DH-1-2017 also added guidance for instrumentation setup, multiple air-intakes, and control settings; lowered air temperature; and tightened tolerances. Specifically, AHAM DH-1-2017 lowered the standard dry-bulb temperature condition for dehumidifiers from 80 °F (as in ANSI/AHAM DH-1-2008) to 65 °F (with the required wet-bulb temperature changing accordingly to maintain the same relative humidity) and tightened the maximum allowed variation for dry-bulb and wet-bulb temperature readings from 2.0 °F to 1.0 °F and from 1.0 °F to 0.5 °F, respectively. In the June 2022 NOPR, DOE requested comment on the proposal to incorporate AHAM DH-1-2017 by reference.

DOE also noted in the June 2022 NOPR that the AHAM DH-1 task force had released a publicly available draft version of the updated standard, AHAM DH-1-2022, on March 30, 2022, but had not yet finalized the standard. DOE had reviewed the changes to AHAM DH-1-2017 made in the draft and either proposed to adopt the changes or raised them for comment in the NOPR. DOE also stated that if AHAM DH-1-2022 was finalized during the course of this rulemaking, DOE would consider adopting that updated version in the final rule to the extent it is consistent with the discussions presented in the NOPR. 87 FR 35286, 35292 (*See also* Public Meeting Transcript, No. 11 at pp. 8–10).

MIAQ supported DOE’s proposal to incorporate AHAM DH-1-2017 by reference. (MIAQ, No. 15 at p. 4)

AHAM recommended that DOE adopt a more recently updated version of AHAM DH-1, (*i.e.*, AHAM DH-1-2022), resulting from cooperation between AHAM, DOE, and efficiency advocates. AHAM noted that AHAM DH-1-2022 addresses many of the issues that DOE raised in the June 2022 NOPR and is consistent with EPCA’s requirements that an amended test procedure be reasonably designed to produce test results that represent an average period of use and not unduly burdensome to conduct. (AHAM, No. 17 at pp. 1–2)

AHAM DH-1-2022 was finalized and published on December 12, 2022. DOE has reviewed AHAM DH-1-2022 and found it is reasonably designed to produce test results that represent an average period of use and not unduly burdensome to conduct, and is therefore incorporating by reference this version of the industry standard with the following exceptions: the test duration, as discussed in section III.C.5 of this document; the sampling tree requirements in section 8.4 of the standard, as discussed in section III.C.6 of this document; and the run-in period and pre-stabilization period requirements in sections 5.6 and 5.7 of the standard, discussed in the section that follows. DOE further

found that the provisions it is adopting in this final rule are consistent with the 2017 edition of the standard and the discussions presented in the June 2022 NOPR. of these exceptions and DOE's amendments to the AHAM DH-1-2022 approach that are adopted in this final rule are discussed below in the relevant sections.

### 3. Run-In and Pre-Stabilization Periods

Section 3.1.1.6 of the current appendix X1 requires a run-in period, during which the compressor operates for a cumulative total of at least 24 hours prior to dehumidification mode testing, consistent with ANSI/AHAM DH-1-2008 and AHAM DH-1-2017. AHAM DH-1-2022 adds new requirements for the run-in period in section 5.6 of the standard, namely that the dehumidifier shall not be exposed to temperatures less than 62 °F during the run-in period, and that after the run-in period, the unit must be inactive for 4 hours before the beginning of the pre-stabilization period; a pre-stabilization period was also newly introduced in AHAM DH-1-2022. The new pre-stabilization period, discussed in section 5.7 of AHAM DH-1-2022, takes place between the time a unit is turned on in the test chamber and the start of the 30-minute stabilization period. AHAM DH-1-2022 also specifies that the dehumidifier must not be exposed to temperatures less than 62 °F during the pre-stabilization period.

While not explicitly discussed in AHAM DH-1-2022, it is DOE's understanding through participation in the process to develop AHAM DH-1-2022 that these new provisions in AHAM DH-1-2022 are intended to ensure that there is no frost build-up on the evaporator coils prior to testing, which could directly reduce performance during the test or result in periods of defrost during which a test unit may shut off the compressor, resulting in further reduction in measured efficiency and performance.



DOE has evaluated the additional test burden that would be associated with the new provisions in AHAM DH-1-2022. These new requirements in AHAM DH-1-2022 would increase the total time required to test a dehumidifier by 4 hours compared to the current testing time of approximately 30 hours. Furthermore, ensuring that the ambient temperature remains above 62 °F during the run-in period and pre-stabilization period could require that the run-in period be conducted in a different location in the laboratory that has better temperature controls and monitoring rather than the current locations within the test laboratory where they may be currently performed.

DOE has conducted an evaluation to determine whether the new requirements in AHAM DH-1-2022 would satisfy the EPCA criteria that test procedures produce test results that measure energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative average use cycle or period of use, without being unduly burdensome to conduct. (42 U.S.C. 6293(b)(3)) Specifically, DOE reviewed testing that was conducted in support of this rulemaking to determine whether the addition of the pre-stabilization period and the temperature requirement for the run-in period would improve the representativeness of test results. DOE's review of its test data indicates that the 30-minute stabilization period conducted in the chamber at the test temperature of 65 °F, during which all conditions are maintained and the test unit operates in a stable manner, is sufficient to produce test results that measure the energy use of a dehumidifier during a representative average use cycle or period of use, as none of the dehumidifiers tested entered defrost operation at any time during the test. Because DOE does not expect frost to develop during testing that would necessitate a defrost operation, the additional test time and test requirements would not change the performance measured by the test procedure. Furthermore, as discussed in section III.C.5 of this document, DOE considers defrost operation in dehumidifiers to be uncharacteristic of typical dehumidifier operation at the 65 °F test condition. Based on this evaluation,

DOE has determined that the new requirements in AHAM DH-1-2022 would not provide an improvement in representativeness commensurate with the additional test burden that would be imposed, and therefore would be unduly burdensome. As the new AHAM DH-1-2022 run-in and pre-stabilization requirements do not conflict with the current appendix X1 requirements, manufacturers may choose to test units in accordance with the AHAM DH-1-2022 run-in and pre-stabilization requirements and still comply with the DOE test procedure. Therefore, DOE is maintaining the current appendix X1 run-in period requirements in this final rule.

#### 4. Variable-Speed Dehumidifiers

##### a. Variable-Speed Compressors

Some dehumidifiers available on the U.S. market incorporate variable-speed compressors (*i.e.*, “variable-speed dehumidifiers”). A variable-speed compressor can operate at a variety of speeds rather than just the single speed achievable by conventional compressors. A single-speed compressor cycles on and off during operation, which can introduce inefficiencies in performance often referred to as “cycling losses,” whereas a variable-speed compressor is able to adjust its speed up or down during operation, thereby reducing or eliminating cycling losses. Variable-speed dehumidifiers may avoid condensate re-evaporation into the ambient room air, which can occur when a dehumidifier cycles off its compressor but not its fan during off-cycle mode. The current test procedure in appendix X1 does not capture any “cycling losses” for single-speed dehumidifiers (nor, conversely, does it capture the avoidance of such losses for variable-speed dehumidifiers) because the test unit operates at full capacity throughout the test.

In the June 2022 NOPR, DOE evaluated whether the avoidance of “cycling losses” for variable-speed dehumidifiers provides significant energy savings that should be captured by the test procedure, as in the case of room air conditioners and portable air

conditioners. Based on DOE's evaluation, and consistent with the points raised by commenters, DOE tentatively determined in the June 2022 NOPR that variable-speed dehumidifiers may not be able to achieve significant efficiency gains over single-speed units, given that dehumidifiers must maintain evaporator temperatures below the dew point to efficiently remove water from the air. 87 FR 35286, 35293. DOE noted, however, that there could be some efficiency gains if the variable-speed compressor is inherently more efficient. DOE requested information and data regarding any efficiency and performance benefits associated with variable-speed dehumidifiers, both generally and relative to those with single-speed dehumidifiers. *Id.*

DOE did not receive additional information and data regarding any efficiency and performance benefits associated with variable-speed dehumidifiers and therefore is not adopting additional test procedure provisions to address their operation.

#### b. Multiple Test Conditions

The current test procedure specified in appendix X1 requires one test condition for each category of dehumidifier: a dry-bulb temperature of 65 °F for portable dehumidifiers and 73 °F for whole-home dehumidifiers. *See* section 4.1.1 of appendix X1.

In the June 2022 NOPR, in response to comments submitted by interested parties, DOE considered expanding the portable dehumidifier test to three test conditions. 87 FR 35286, 35296–35297. DOE discussed its findings through investigative testing that a three-temperature-condition approach resulted in no substantive improvement in representativeness compared to the current test procedure that uses a single temperature condition. *Id.* Accordingly, DOE tentatively determined that the increase in test burden associated with requiring multiple test conditions would not be justified, and DOE did not propose any new test conditions in the June 2022 NOPR. *Id.*

Aprilaire supported maintaining a single-temperature-condition test procedure for each dehumidifier configuration. Aprilaire stated that additional test conditions would result in unwarranted test burden in the form of lengthened product design cycles and added quality control costs. (Aprilaire, No. 14 at p. 1)

MIAQ stated that a three-temperature-condition test would be more representative of the average period of use for a dehumidifier and supported expanding the number of test conditions required. MIAQ noted that dehumidifiers can have a variety of inlet process air conditions depending on their installation configuration or placement within a home. MIAQ stated that more test conditions would provide additional information to consumers and industry stakeholders while not constituting an unnecessary test burden. (MIAQ, No. 15 at pp. 4–5)

As discussed in the June 2022 NOPR, while dehumidifiers may encounter temperatures between 55 °F and 80 °F depending on their installation and operating conditions, DOE’s investigative testing showed that when additional test conditions were added and performance at these test conditions was weighted based on the operating hours DOE expected at each test condition, the resulting efficiency corresponded very closely to the measured efficiency at 65 °F using the existing test procedure. 87 FR 35286, 35296–35297. This result suggests that the current single test condition already produces a measure of efficiency that is representative of dehumidifier performance across the range of temperature conditions it may encounter. Therefore, DOE maintains its conclusion that the weighted-average performance based on additional test conditions is not substantively different than the performance represented by the current single-temperature-condition test procedure. Accordingly, DOE has determined that the additional test burden that would be associated with a three-temperature-condition test would be unduly burdensome. Therefore, in this final rule, DOE is maintaining the existing single-temperature-condition test approach in appendix X1.

### c. Load-Based Test

Under the current test procedure, temperature and humidity conditions are held constant throughout the test (*i.e.*, a steady-state test). As such, the test unit operates at full capacity throughout the duration of the test.

In the July 2015 Final Rule, DOE considered a load-based test for dehumidifiers, which would capture cycling behavior in dehumidifiers with single-speed compressors or compressor speed modulation for variable-speed dehumidifiers. The load-based test would involve adding moisture to the test chamber at a fixed rate and allowing the control system of the dehumidifier to respond to changing moisture levels in the room. 80 FR 45801, 45809. DOE determined not to adopt a load-based test for the dehumidifier test procedure in the July 2015 Final Rule, due to concerns about the potential increase in test burden. *Id.* at 80 FR 45810.

In the June 2022 NOPR, DOE presented the results of investigative testing using a load-based approach. 87 FR 35286, 35298–35299. The testing did not show that variable-speed dehumidifiers were more efficient than single-speed dehumidifiers. This finding corresponded with the evaluation discussed above that variable-speed dehumidifiers do not have any unique efficiency benefits over single-speed dehumidifiers. In the June 2022 NOPR, DOE tentatively concluded that load-based testing was not appropriate for appendix X1 because the increases in test burden were not justified by improvements in test representativeness. *Id.*

Aprilaire agreed that load-based testing should not be implemented in appendix X1 due to novel testing challenges associated with load-based testing. Aprilaire stated that overcoming these challenges would represent a significant test burden and could limit competition because smaller manufacturers may not be able to conduct load-based testing. (Aprilaire, No. 14 at pp. 1–2)

MIAQ stated that it does not produce dehumidifiers with variable-speed dehumidifiers. MIAQ commented that the most efficient way to operate a dehumidifier is to operate at full capacity and that reductions in dehumidification capacity due to variable-speed operation are hard for users to perceive and have little effect on mold or mildew control. Because variable-speed dehumidifiers offer little consumer benefit, MIAQ stated that load-based testing would constitute an unnecessary test burden. (MIAQ, No. 15 at pp. 5–6)

The anonymous commenter supported load-based testing. (Anonymous, No. 12 at p. 1)

The Joint Commenters encouraged DOE to continue investigating load-based testing for dehumidifiers. While DOE did not find that load-based testing captured any unique efficiency of variable-speed dehumidifiers, the Joint Commenters noted that the discrepancy between the performance of the single-speed and variable-speed units under load-based testing suggests that the current DOE test procedure may overestimate the real-world efficiency of variable-speed units. (Joint Commenters, No. 18 at pp. 1–2; Appliance Standards Awareness Project, Public Meeting Transcript, No. 11 at pp. 25–26)

DOE's testing showed that as the moisture load (*i.e.*, the rate at which moisture was introduced to the test room) decreased below the full-load dehumidification capacity of the dehumidifiers tested, the efficiency of both the single-speed and variable-speed dehumidifiers decreased. As the load decreased, the efficiency of the variable-speed dehumidifier decreased by a greater amount than for the single-speed dehumidifier, contrary to any initial expectation that the variable-speed dehumidifier would operate more efficiently than the single-speed dehumidifier at reduced loads. 87 FR 35286, 35299. This result confirmed DOE's understanding that variable-speed dehumidifiers do not offer efficiency benefits relative to single-speed dehumidifiers. However, the finding that the variable-speed dehumidifier performed less efficiently than the single-speed

dehumidifier at the same conditions was unexpected, given DOE's understanding that variable-speed and single-speed dehumidifiers typically operate in the same manner in real-world conditions (*i.e.*, cycling the compressor on and off to maintain the relative humidity setpoint). This result from testing a single variable-speed and single-speed dehumidifier suggests that future investigation may be warranted to better understand any differences between variable-speed and single-speed dehumidifier performance at such time that additional variable-speed dehumidifiers are available for testing.

AHAM requested that DOE provide test data from load-based testing on the record, along with details of the load-based test procedure used. Specifically, AHAM requested data regarding the test conditions (dry-bulb temperature, *etc.*), general information about test setup including dehumidifier set point, use of manufacturer settings, type of test room, rate of moisture load change, method of moisture load control and monitoring, and whether DOE conducted a repeatability assessment. (AHAM, No. 17 at p. 4)

In response to AHAM's request, DOE describes its investigative load-based testing process. DOE conducted the investigative load-based testing for this rulemaking with the test chamber at the appendix X1 portable dehumidifier test conditions—65 °F dry-bulb and 56.6 °F wet-bulb. The dehumidifiers were set using user controls to maintain a 60-percent relative humidity in the room. The testing was conducted in a calorimeter chamber in order to achieve the precise level of moisture control necessary to conduct load-based testing, because as discussed in the June 2022 NOPR, psychrometer chambers lack the equipment and controls necessary to maintain a given moisture load (*see* 87 FR 35286, 35297). DOE did not conduct tests with a dynamically variable moisture load, but instead collected performance data with the moisture introduction rate held fixed at percentages of the full-load dehumidification capacity of each tested unit. The testing was conducted in a calorimeter chamber in order to achieve the precise level

of moisture control necessary to conduct load-based testing. DOE tested two dehumidifiers with comparable capacities from the same manufacturer, one with a variable-speed compressor and one with a single-speed compressor. This investigative testing effort included testing each unit once at each of the four tested moisture load conditions (100 percent, 75 percent, 50 percent, and 25 percent of the full-load dehumidification capacity for the unit under test). 87 FR 35286, 35298.

Based on DOE's finding discussed in the June 2022 NOPR that load-based testing does not improve the representativeness of the dehumidifier test procedure, concerns about the potential significant increase in test burden, and in the absence of any additional data from commenters showing the viability of load-based testing, DOE is not prescribing a load-based test in appendix X1 in this final rule.

## 5. Test Duration

Appendix X1 requires a test duration of 6 hours for the dehumidification mode test, after a 30-minute stabilization period. *See* section 5.4 of appendix X1. In the June 2022 NOPR, DOE discussed that DOE and AHAM's DH-1 working group identified an opportunity to reduce this test duration, thereby reducing test burden. 87 FR 35286, 35299–35300. To identify a potential shorter test duration that could be considered, DOE conducted investigative testing on 13 portable dehumidifiers of varying capacities, one of which was variable-speed, at the 65 °F dry-bulb temperature, in accordance with appendix X1. DOE used the gravity drain condensate collection approach in appendix X1 and recorded the weight of the condensate collected every 30 seconds. *See* section 3.1.1.4 of the current appendix X1. DOE was, therefore, able to calculate energy



consumption and collected condensate at any of the 30-second intervals throughout the 6-hour test and did so at each hour of testing.

The results of DOE's testing indicated that capacity and efficiency vary only slightly from the 6-hour test results when using shorter test durations. This investigative testing suggested that a 6-hour dehumidification mode test duration for portable dehumidifiers may be unnecessary, as the data showed there is minimal difference in measured efficiency between the 2-hour and 6-hour test durations. DOE tentatively determined that a 2-hour test duration is appropriate for both whole-home dehumidifiers and portable dehumidifiers and would provide representative results with minimized test burden. DOE also recognized, however, that removing the requirement for a 6-hour test duration would require recertification for units previously certified under a test duration of 6 hours. Therefore, in the June 2022 NOPR, DOE proposed a dehumidification mode test duration of either 2 or 6 hours for both portable and whole-home dehumidifiers. 87 FR 35286, 35299–35300. DOE notes that AHAM DH-1-2022 contains the same provision specifying either a 2-hour or 6-hour test.

Aprilaire supported DOE's proposal to add a 2-hour test option and stated that based on its testing experience, results for both portable and whole-home dehumidifiers at this shorter test duration would not vary significantly. (Aprilaire, No. 14 at p. 2)

MIAQ stated that the variation in power use and condensate collected over the course of tests on two units running for 2, 3, 4, 5, and 6 hours was under 4 percent for all test durations. MIAQ noted that neither unit entered a defrost cycle during this testing and stated that a 4-hour or 6-hour test would be more appropriate for a unit that enters a defrost cycle. MIAQ stated that reducing the required test time to 2 hours would represent a reduction in test burden, mainly in the form of saved technician hours. The reduced test burden could allow 2-3 times more tests to be conducted per day for the same cost. (MIAQ, No. 15 at pp. 6, 9)

AHAM stated that a 2-hour test duration would result in a loss of test repeatability and reproducibility for dehumidifiers that enter defrost during the test. AHAM noted that defrost cycles are within typical use conditions and should be considered in the DOE test procedure. AHAM commented that in a 2-hour test, a defrost cycle could account for 30 minutes of the 2-hour test, or 25 percent of the total test time; whereas, in a 6-hour test, this 30-minute cycle would only account for 8 percent of the test time, resulting in a higher efficiency rating more representative of the actual percentage of time spent by dehumidifiers in defrost cycles in the field. AHAM generally favored test procedure amendments that decrease test burden but commented that in this case, the 2-hour test period is more likely to cause a failed test or force manufacturers to conservatively rate their products to avoid false findings of noncompliance. AHAM asked whether DOE would conduct enforcement testing using the test duration used in the certification test or whether the verification laboratory would be able to choose the duration used. Because of the potential impacts on measured efficiency, AHAM stated that if DOE proceeds with the proposed 2-hour test duration, DOE should require compliance with the revised test procedure when the amended energy conservation standards next come into effect. (AHAM, No. 17 at p. 3)

GEA presented data detailing the performance of how a dehumidifier entering defrost mode impacts the measured efficiency over a number of test durations, with lower impacts associated with longer test durations. GEA's data showed a decrease in variance in efficiency results of approximately 5 percent in a 2-hour test down to approximately 2 percent in a 6-hour test. According to GEA, these data show that a 2-hour test option would have an unacceptable amount of variance due to the impact of defrost cycles. GEA supported AHAM's position that the test procedure should include only a 6-hour test option, which would reduce these impacts to an appropriate level. (GEA, No. 16 at p. 1)

DOE recognizes that 30 minutes of defrost activity within a 2-hour test would be likely to impact the final measured efficiency, given that 30 minutes would represent a significant portion of a 2-hour test period. However, DOE notes that the defrost operation shown in GEA's data appears to occur roughly 5 hours and 30 minutes into the test duration, suggesting that the defrost operation would not affect the result of a 2-hour test for this GEA unit. Additionally, based on extensive testing in support of this rulemaking, DOE has not observed defrost behavior in any models at the appendix X1 test conditions. Specifically, none of the 13 units that DOE tested in support of this rulemaking entered defrost operation at any point during the test. Based on these observations, DOE concludes that defrost operation is uncharacteristic of dehumidifier operation while conducting the appendix X1 test procedure. While the data provided by GEA does show a unit entering defrost operation, it is unclear which model was tested, which test procedure was performed, and whether the model that was tested is currently on the market and certified to the currently applicable appendix X1. As discussed above, no units in DOE's sample of dehumidifiers, containing models representative of products on the market certified using the currently applicable appendix X1, entered defrost operation during the test. Therefore, DOE finds that a 2-hour test duration produces test results that are representative of dehumidifier operation by consumers.

For the reasons discussed in the June 2022 NOPR, and in consideration of comments as discussed in this section, DOE has concluded that a 2-hour test duration produces test results that are comparable to test results produced by a 6-hour test duration, that test results produced by a 2-hour test duration are representative of dehumidifier operation by consumers, and that a 2-hour test duration would reduce test burden as compared to a 6-hour test duration. As discussed above, DOE does not consider defrost operation to be characteristic of dehumidifiers at the DOE test condition, so DOE has concluded that retaining the 6-hour test option is not necessary to maintain

test procedure representativeness or reproducibility nor would adopting a 2-hour test duration require re-testing of any currently certified dehumidifier, given that measured performance would be comparable under a 2-hour and 6-hour test. Retaining the option of either a 2-hour or 6-hour test duration could create ambiguity regarding which test duration should be used for certification, as noted in AHAM's comments. Accordingly, in this final rule, DOE is adopting a 2-hour test duration requirement for appendix X1. DOE is not maintaining an option to perform a 6-hour test, as was proposed in the June 2022 NOPR.

## 6. Psychrometer Setup and Instrumentation

Appendix X1, through reference to section 4 "Instrumentation" of ANSI/AHAM DH-1-2008, requires dehumidifiers with a single air intake to be monitored with an aspirating-type psychrometer<sup>6</sup> perpendicular to, and 1 foot in front of, the unit; and, in the case of multiple air intakes, monitored with a separate sampling tree. *See* sections 3.1.1, 3.1.1.2, 3.1.1.3 of appendix X1.

The test procedure at appendix X1 does not currently permit the use of a sampling tree in conjunction with an aspirating psychrometer to measure relative humidity for portable dehumidifiers with a single air inlet. In the July 2015 Final Rule, DOE was unable to conclude whether using a psychrometer only or using a psychrometer in conjunction with a sampling tree would produce the most repeatable results. 80 FR 45802.

DOE is aware, however, that using a sampling tree with an aspirating psychrometer is standard practice for many test laboratories when conducting psychrometric testing. Therefore, in the June 2022 NOPR, DOE proposed to allow

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<sup>6</sup> In an aspirating-type psychrometer, a wet-bulb and a dry-bulb thermometer are mounted inside a case that also contains a fan. The fan draws air across both thermometers, and the resulting wet-bulb and dry-bulb temperatures are used to determine the percent relative humidity.

measurements taken using an aspirating psychrometer or relative humidity sensor with a sampling tree in appendix X1 for dehumidifiers with a single air inlet, which is required in the currently applicable test procedure for dehumidifiers with multiple air inlets. 87 FR 35286, 35302.

Aprilaire supported DOE's proposal to allow use of an aspirating psychrometer in conjunction with a sampling tree to measure humidity. Aprilaire stated that this sort of apparatus is common and familiar in the HVAC industry. (Aprilaire, No. 14 at p. 2)

MIAQ supported DOE's proposal of allowing relative humidity measurements taken using an aspirating psychrometer with sampling tree in appendix X1 for dehumidifiers with a single air inlet. (MIAQ, No. 15 at pp. 6–7)

AHAM stated that sampling trees should be required for both psychrometer testing (as was proposed) and for relative humidity sensors. AHAM claimed that use of sampling trees leads to more representative results by sampling across the entire inlet air of the dehumidifier and noted that sampling trees are already required in the test procedures for other HVAC equipment. AHAM stated that multiple measurement points are needed to produce representative results because dehumidifiers measure air temperature and humidity using air from a wider inlet area, not a single point. (AHAM, No. 17 at p. 2)

These comments support DOE's understanding that using a sampling tree with an aspirating psychrometer is already standard practice for many test laboratories when testing dehumidifiers; effectively measures the inlet operating conditions for a dehumidifier while under test, both for units with a single air inlet and for units with multiple air inlets; and facilitates the determination of representative dehumidifier performance. Therefore, for the reasons discussed in the June 2022 NOPR and summarized above, DOE is permitting the use of sampling trees in conjunction with either an aspirating psychrometer or relative humidity sensor for all dehumidifier test

configurations in appendix X1. DOE is not aware of data that quantify any benefits that sampling trees may provide over a single point measurement and is thus unable to determine if requiring sampling trees for all dehumidifier tests, as AHAM suggests, would be unduly burdensome for test laboratories that currently use single-point aspirating psychrometer or relative humidity sensor measurements. Therefore, to avoid imposing an undue test burden, DOE is allowing the test procedure to be conducted with or without sampling trees in appendix X1 in this final rule, when using either an aspirating psychrometer or relative humidity sensor.

In addition to the proposal to allow sampling trees in conjunction with aspirated psychrometer testing, DOE proposed in the June 2022 NOPR to require that the sensing elements within the psychrometer box be shielded or positioned to minimize radiation effects from the fan motor; that there be line of sight separation between any fans and sensing elements within the test fixture; and that at least 3 feet of separation, along the path of airflow, be maintained between any fans and sensing elements within the test fixture. 87 FR 35286, 35302. DOE notes that AHAM subsequently adopted the same requirements for psychrometer shielding and placement in AHAM DH-1-2022.

MIAQ supported DOE's proposal to require that the psychrometer box contain shielding or be configured to minimize radiation effects on the sensing elements.

(MIAQ, No. 15 at p. 7)

For the reasons discussed in the June 2022 NOPR, in this final rule, DOE is incorporating in appendix X1 the AHAM DH-1-2022 requirements for psychrometer shielding and placement. These requirements are consistent with the requirements for psychrometer shielding and placement as proposed in the June 2022 NOPR.

## 7. Whole-Home Dehumidifiers

In the July 2015 Final Rule, DOE established a test procedure for whole-home dehumidifiers in appendix X1. 80 FR 45802, 45810–45811. Whole-home dehumidifiers differ from portable dehumidifiers, as they are installed in a ducted configuration in a home. The whole-home dehumidifier test procedure specifies a ducted test setup with instructions for measuring and maintaining the air flow through these ducts. *See* section 3.1.3 of appendix X1.

### a. Air Velocity

Section 5.2 of AHAM DH-1-2017 requires that “the air flow approaching the test unit shall be uniform in temperature, humidity and velocity. The air velocity shall not exceed 50 feet per minute (“ft/min”) (0.25 meters per second (“m/s”)) within 3 ft (0.91 m) of the dehumidifier with the unit not operating.”

In the June 2022 NOPR, DOE considered alternate air velocity specifications based on suggestions by commenters that the 50 ft/min maximum air velocity requirement in AHAM DH-1-2017 may represent an undue burden on manufacturers of large-capacity portable dehumidifiers and whole-home dehumidifiers. Although DOE did not propose changing the maximum air velocity requirement in the June 2022 NOPR, DOE discussed that it would consider raising the maximum air flow requirement by an amount appropriate to the increased air flow of the largest units on the market, *e.g.*, to 100 ft/min. DOE stated, however, that it was not aware of any data that quantify the impact on repeatability and reproducibility of raising the maximum air velocity requirement to a less-stringent level. 87 FR 35286, 35302–35303.

MIAQ recommended that DOE continue to investigate the value of an increased air velocity. MIAQ noted that it is in the process of conducting air velocity testing and

would be willing to confidentially share this data with DOE for analysis. (MIAQ, No. 15 at p. 7)

DOE notes that AHAM DH-1-2022 maintains 50 ft/min maximum air velocity requirement, indicating that there is not an industry consensus that a requirement higher than 50 ft/min would be acceptable. DOE has not received any data supporting that a 100 ft/min air velocity requirement would maintain test procedure repeatability and reproducibility. Therefore, without sufficient data to confirm that this test procedure change would allow for equally repeatable and reproduceable tests as the current requirement, in this final rule, DOE is maintaining the air velocity minimum requirement of 50 ft/min, consistent with AHAM DH-1-2022.

#### b. Nozzle Test Method

Section 3.1.2.2.3.2 of appendix X1 specifies measuring velocity pressures using the same pitot traverses as are used for measuring external static pressure (“ESP”), which are specified in section 3.1.2.2.3.1 of appendix X1, and calculating volumetric flow rates in each duct in accordance with section 7.3.1, “Velocity Traverse,” of ANSI/AMCA 210.

In the June 2022 NOPR, DOE summarized a comment submitted by Aprilaire asserting that there are a limited number of test facilities that still use this technology for measuring airflow. 87 FR 35286, 35303. Aprilaire suggested that DOE adopt the alternative method of using airflow nozzles to measure airflow as specified in section 7.3.2 of ANSI/AMCA 210. Aprilaire stated that most laboratories are using the nozzle method in ANSI/AMCA 210 for measuring airflow and that this method is listed by ASHRAE Standard 37 as the method to use for HVAC equipment. *Id.*



In the June 2022 NOPR, DOE discussed that it had inquired with a number of laboratories and is aware that a limited number of test laboratories use pitot-tube traverses when conducting testing in accordance with ANSI/AMCA 210. (*See* sections 4.2.2, 4.3.1, and 7.3.1 of ANSI/AMCA 210) DOE discussed that it is aware that test laboratories typically use the alternate calibrated nozzle approach detailed in sections 4.2.3, 4.3.2 and 7.3.2 of ANSI/AMCA 210 when conducting testing in accordance with ANSI/AMCA 210 for products other than dehumidifiers, which is not currently permitted in appendix X1. Based on the industry-accepted standard (*i.e.*, ANSI/AMCA 210), the understanding that the two approaches are substantively similar, and feedback from test laboratories that use of the calibrated nozzle approach can reduce the test burden as compared to use of the pitot-tube traverses, DOE proposed in the June 2022 NOPR to allow calibrated nozzle testing according to the requirements of sections 4.2.3, 4.3.2, and 7.3.2 of ANSI/AMCA 210 for whole-home dehumidifiers in appendix X1. 87 FR 35286, 35303.

Aprilaire and MIAQ both supported DOE's proposal to include the calibrated nozzle approach from AMCA 210 in the appendix X1 test procedure for whole-home dehumidifiers. (Aprilaire, No. 14 at p. 2; MIAQ, No. 15 at p. 7)

DOE concludes, for the reasons discussed in the June 2022 NOPR, that the calibrated nozzle approach from ANSI/AMCA 210 produces repeatable and reproduceable results consistent with the pitot tube traverse method. Therefore, in this final rule, DOE is permitting the use of the calibrated nozzle approach in appendix X1, as proposed in the June 2022 NOPR.

#### c. Ventilation Air

Section 3.1.3 of appendix X1 requires capping and sealing any fresh-air inlet on a whole-home dehumidifier during testing. In the July 2015 Final Rule, DOE determined

that, while sealing the fresh-air inlet on dehumidifiers designed to operate with the fresh-air intake open may negatively impact capacity and efficiency, those effects are not significant enough to warrant the added test burden of providing separate fresh-air inflow. 80 FR 45802, 45811. In the June 2022 NOPR, DOE summarized comments received by interested parties stating that capping the fresh-air intake should not appreciably impact the total airflow through the unit and subsequently should have little effect on the efficiency. DOE stated that is not aware of publicly available data, nor has DOE received information from commenters, regarding the prevalence of fresh-air inlet use among whole-home dehumidifier consumers. DOE further stated that comments received on this issue are consistent with DOE's prior determination that the burden of adding an additional air stream in the testing configuration to account for fresh-air inlet on those whole-home dehumidifiers equipped with such a feature would outweigh the benefits. Therefore, in the June 2022 NOPR, DOE tentatively determined to continue requiring capping and sealing the fresh-air inlet during testing of a whole-home dehumidifier in appendix X1. 87 FR 35286, 35303.

MIAQ supported DOE's tentative determination to retain the requirement to cap and seal the fresh-air inlet during testing of a whole-home dehumidifier. (MIAQ, No. 15 at p. 7)

For the reasons discussed in the June 2022 NOPR, DOE is retaining the requirement to cap and seal the fresh-air inlet during testing of a whole-home dehumidifier in appendix X1 in this final rule.

#### d. External Static Pressure

The DOE test procedure at appendix X1 requires that the ESP, the difference in process air outlet static pressure minus the process air inlet static pressure, be 0.2 inches

of water column (“in. w.c.”) for the duration of the test when conducting whole-home dehumidifier testing. *See* section 3.1.2.2.3.1 of appendix X1.

In the June 2022 NOPR, DOE responded to comments submitted by MIAQ suggesting that DOE adopt two to different ESP conditions—one at 0 in. w.c. and the other at 0.4 in. w.c.—for testing whole-home dehumidifiers. In considering this comment, DOE noted that MIAQ did not provide support regarding the representativeness of its suggested ESP requirements. In addition, DOE discussed that it had previously considered and rejected multiple ESP requirements in a previous rulemaking based on a field study and other information. DOE explained that while DOE understands that installation configurations and environmental factors vary for whole-home dehumidifiers, DOE tentatively concluded that testing whole-home dehumidifiers twice—once with 0 in. w.c. ESP and once with 0.4 in. w.c. ESP—would not be sufficiently more representative than the current single 0.2 in. w.c. ESP requirement as to justify the increased test burden. Therefore, DOE did not propose to amend the ESP requirements for whole-home dehumidifiers in the June 2022 NOPR. 87 FR 35286, 35303.

In response to the June 2022 NOPR, Aprilaire noted that HVAC system pressures vary greatly with system design for residential applications. Aprilaire stated that a single static test pressure test point is preferable, as a second test point would increase test burden in the form of both an extra rating test and additional quality verification testing. (Aprilaire, No. 14 at p. 2)

MIAQ stated that 0.2 in. w.c. ESP is a representative test condition for ducted dehumidifiers. MIAQ also suggested that additional research be conducted into whether higher external pressures could be representative of typical installation cases, such as when dehumidifiers are connected to furnace systems. MIAQ cited studies from the

National Renewable Energy Laboratory and the California Energy Commission that observed pressures between 0.53 and 0.9 in. w.c in practice. (MIAQ, No. 15 at pp. 7–8)

For the reasons discussed in the June 2022 NOPR, and in consideration of these additional comments suggesting that 0.2 in. w.c. ESP is a representative test condition for ducted dehumidifiers and that requiring an additional test point would increase test burden, DOE continues to conclude that a single test approach for whole-home dehumidifiers is fully representative of whole-home dehumidifier performance. The studies referenced by MIAQ do not provide information specific to whole-home dehumidifiers sufficient for DOE to determine that ESP conditions between 0.53 and 0.9 in. w.c. are representative of typical whole-home dehumidifier installation. Therefore, DOE is maintaining the current test approach in appendix X1.

#### e. Additional Test Condition

In response to the June 2022 NOPR, MIAQ commented that all whole-home dehumidifiers should be tested at both the whole-home dehumidifier test conditions and the portable dehumidifier test conditions. MIAQ stated that adopting this change would be more representative of actual whole-home dehumidifier operation because whole-home units can be installed in configurations where the inlet air is drawn from indoor basement air, such as in crawlspace applications or when not connected to the HVAC return air stream. (MIAQ, No. 15 at pp. 3–4)

While DOE acknowledges that whole-home dehumidifiers may be installed in situations where the unit inlet air is drawn from unconditioned spaces (*e.g.*, a basement or crawlspace), such a situation does not represent typical operation of these units. As indicated by the product definition, whole-home dehumidifiers are designed to be installed in a ducted configuration, typically in line with an HVAC system, and the test procedure requirements for whole-home dehumidifiers reflect this most representative

installation scenario. Requiring whole-home units to be tested at an additional test condition applicable to portable dehumidifiers would add test burden without improving the representativeness of test results. Therefore, in this final rule, DOE is maintaining the single test condition for whole-home dehumidifiers. However, to the extent that a unit meets both the whole-home and portable dehumidifier definitions, it must be tested in each configuration and comply with both applicable energy conservation standards.

## 8. Network Functions

Many types of consumer products (*e.g.*, refrigerators, clothes dryers, room air conditioners) are now equipped with “network functions,” such as mobile alerts/messages, remote control, and energy information and demand response capabilities to support future smart grid interconnection. In the June 2022 NOPR, DOE noted that certain manufacturers have also incorporated some of these features, such as Wi-Fi capability, into dehumidifiers. 87 FR 35286, 35304.

Based on testing and information from interested parties regarding network functions in consumer products, DOE stated in the June 2022 NOPR that it expects the power consumption attributable to network functions to be on the order of 1 watt (“W”) or less. The impact on IEF of power consumption of network functions is expected to be no more than 1 percent, based on DOE's testing that indicated an average impact on IEF of less than 0.75 percent for the units in DOE's test sample. 87 FR 35286, 35304–35305. DOE also stated that it is aware there are dehumidifiers on the market with varying implementations of network functions. However, DOE stated that it was not aware of any data available, nor did interested parties provide any data, regarding the consumer use of network functions. Without this data, DOE stated it was unable to establish a representative test configuration to assess the energy consumption of network functions for dehumidifiers. *Id.*

Therefore, in the June 2022 NOPR, DOE proposed to specify that if a dehumidifier has network functions, all network functions must be disabled throughout testing using means available to the end user pursuant to instructions provided in the product's user manual. DOE further proposed to specify that if network functions cannot be disabled by the consumer or the manufacturer's user manual does not provide instruction for disabling the function, the energy consumption of the enabled network function must be included, as it is more representative than excluding the energy consumption associated with the network function. *Id.*

Aprilaire, MIAQ, and AHAM supported DOE's proposal to disable network functions if possible. AHAM noted that this proposal is consistent with the draft of AHAM DH-1-2022. (Aprilaire, No. 14 at p. 2; MIAQ, No. 15 at p. 8; AHAM, No. 17 at p. 3)

The anonymous commentor recommended developing test methods which can better accommodate networked models (Anonymous, No. 12 at p. 1)

The Joint Commenters requested that DOE require dehumidifiers to be tested with network functions in the factory default setting if possible, rather than disabled. The Joint Commenters stated that DOE's approach may not be representative of real-world operation, as consumers would be unlikely to disable connected functionality if a unit is shipped with connected functions enabled, and testing using the network default settings would result in a more representative energy use measurement. (Joint Commenters, No. 18 at p. 2; Appliance Standard Awareness Project, Public Meeting Transcript, No. 11 at p. 21)

As discussed in the June 2022 NOPR, DOE is not aware of any consumer usage data, nor did interested parties provide any such data, regarding the consumer use of network connectivity. Without this data, DOE is unable to establish a representative test

configuration for assessing the energy consumption of network connectivity features for dehumidifiers. 87 FR 35286, 35305.

DOE similarly lacks data regarding whether consumers not using connected functions would disable such functions or leave them in the as-shipped setting. Therefore, due to a lack of data regarding consumer usage of network connectivity features and to harmonize with the industry standard, DOE maintains its June 2022 NOPR proposals and in this final rule is requiring that for dehumidifiers with network functions, follow the requirements in section 5.5 of AHAM DH-1-2022, that (1) the network functions must be disabled throughout testing if such settings can be disabled by the end-user and the product's user manual provides instructions on how to do so; and (2) if network functions cannot be disabled by the end-user, or the product's user manual does not provide instruction for disabling network functions, then the unit must be tested with the network functions in the factory default configuration for the test period.

## 9. Removal of Appendix X

Appendix X to subpart B of 10 CFR part 430 is no longer required for use. For dehumidifiers manufactured on or after January 27, 2016, use of appendix X1 to subpart B of 10 CFR part 430 is required for any representations of energy use or efficiency of portable and whole-home dehumidifiers, including demonstrating compliance with the currently applicable energy conservation standards. As discussed in this document, DOE is maintaining the currently applicable appendix X1, with amendments. The updated version of appendix X1 will be used for the evaluation and issuance of any updated efficiency standards, and for determining compliance with those standards. In the June 2022 NOPR, DOE proposed to remove the obsolete appendix X. 87 FR 35286, 35305.

MIAQ supported DOE's proposal to remove appendix X along with all references to appendix X in 10 CFR parts 429 and 430.

In this final rule, DOE removes appendix X to subpart B of 10 CFR part 430, along with all references to appendix X in 10 CFR part 430.

#### *D. Test Procedure Costs*

EPCA requires that test procedures proposed by DOE not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3)) DOE has determined that the amendments in this final rule are not unduly burdensome. The following sections discuss DOE's evaluation of estimated costs and savings associated with the amendments to appendix X1.

In this final rule, DOE updates the existing test procedure for dehumidifiers by amending appendix X1 to incorporate the current version of the applicable industry standard, specify the dehumidification mode rating test period to be 2 hours, permit the use of a sampling tree in conjunction with an aspirating psychrometer or relative humidity sensor for a dehumidifier with a single process air intake grille, and specify requirements for testing dehumidifiers with network functions. If the network functions can be disabled by the end-user and instructions to disable appear in the manual, test with those functions disabled; otherwise, test in the factory default setting. DOE has determined that these proposed amendments would not increase testing costs. As discussed in the following paragraphs, DOE has also determined that two amendments would likely reduce testing costs: shortening the test duration and permitting use of a sampling tree.

##### **1. Reduced Test Period**

DOE amends appendix X1 to specify the dehumidification mode rating test period to be 2 hours for portable and whole-home dehumidifiers. As discussed in section III.C.5 of this document, DOE expects that this amendment will decrease test cost for dehumidifier manufacturers due to reduced test chamber time. Based on past experiences



with conducting appendix X1 testing, DOE estimates that 6 hours in a psychrometric chamber for dehumidifier testing according to appendix X1 costs \$1,100. Reducing the test period by 4 hours yields an estimated cost savings per test of \$750, which is two-thirds of the estimated cost of operation of the test chamber for 6 hours.

DOE has determined that the amendments would not affect the representations of dehumidifier energy efficiency/energy use, as discussed in section III.C.5 of this document. DOE expects that manufacturers would be able to rely on data generated under the current test procedure. As such, retesting and recertification of dehumidifiers would not be required solely as a result of DOE's adoption of the amendments to the test procedure.

## 2. Sampling Tree

DOE amends appendix X1 to allow relative humidity measurements using an aspirating psychrometer or relative humidity sensor with a sampling tree for all dehumidifiers. As discussed in section III.C.6 of this document, DOE expects this would not substantively impact repeatability or reproducibility of the test procedure or the representativeness of the measured energy efficiency. The amendment would not result in a change of the measured energy efficiency of any currently certified dehumidifiers because the proposed use of a sampling tree would be an alternate test set-up to the current test set-up. The amendment would also likely reduce the test burden for certain test laboratories that would otherwise be required to change their aspirating psychrometer or relative humidity sensor configuration to remove the sampling tree and reposition the psychrometer within the test chamber. There is no cost attributable to this amendment.

DOE has determined that the amendments in this final rule would not impact the measured energy use or representations of dehumidifier energy efficiency/energy use. DOE has also determined that manufacturers would be able to rely on data generated

under the current test procedure as amended. As such, DOE does not expect re-testing of any dehumidifier would be required solely as a result of DOE's adoption of these amendments to the test procedure.

### 3. Other Amendments

DOE has determined that the amendments to incorporate the updated version of the relevant industry testing standard and to provide additional direction regarding units with network functions will not change the measured energy efficiency as compared to the current test procedure and would not change the test costs. DOE expects that manufacturers would be able to rely on data generated under the current test procedure. As such, retesting and recertification of dehumidifiers would not be required solely as a result of DOE's adoption of the amendments to the test procedure. Based on review of AHAM DH-1-2022, DOE expects that the amended test procedure for measuring IEF will not increase testing costs per unit compared to the current DOE test procedure. DOE also does not expect that the direction to disable network functions during testing will impact test cost or the measured energy efficiency, as network function does not represent a significant portion of the overall energy efficiency, as discussed previously.

While DOE does not expect that the amendments to the test procedure will require manufacturers to re-test and recertify their models, manufacturers may choose to re-test units using the new test procedure. DOE estimates that testing under the new test procedure would cost roughly \$2,000 per test, based on recent testing quotes and reduced testing cost due to the shorter test duration.

#### *E. Effective and Compliance Dates*

The effective date for the adopted test procedure amendment will be 30 days after publication of this final rule in the *Federal Register*. EPCA prescribes that all

representations of energy efficiency and energy use, including those made on marketing materials and product labels, must be made in accordance with an amended test procedure, beginning 180 days after publication of the final rule in the *Federal Register*. (42 U.S.C. 6293(c)(2))

EPCA provides an allowance for individual manufacturers to petition DOE for an extension of the 180-day period if the manufacturer may experience undue hardship in meeting the deadline. (42 U.S.C. 6293(c)(3)) To receive such an extension, petitions must be filed with DOE no later than 60 days before the end of the 180-day period and must detail how the manufacturer will experience undue hardship. *Id.* To the extent the modified test procedure adopted in this final rule is required only for the evaluation and issuance of updated efficiency standards, compliance with the amended test procedure does not require use of such modified test procedure provisions until the compliance date of updated standards.

#### **IV. Procedural Issues and Regulatory Review**

##### *A. Review Under Executive Orders 12866, 13563, and 14094*

Executive Order (“E.O.”)12866, “Regulatory Planning and Review,” as supplemented and reaffirmed by E.O. 13563, “Improving Regulation and Regulatory Review,” 76 FR 3821 (Jan. 21, 2011) and amended by E.O. 14094, “Modernizing Regulatory Review,” 88 FR 21879 (April 11, 2023), requires agencies, to the extent permitted by law, to (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify); (2) tailor regulations to impose the least burden on society, consistent with obtaining regulatory objectives, taking into account, among other things, and to the extent practicable, the costs of cumulative regulations; (3) select, in choosing

among alternative regulatory approaches, those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity); (4) to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and (5) identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior, such as user fees or marketable permits, or providing information upon which choices can be made by the public. DOE emphasizes as well that E.O. 13563 requires agencies to use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible. In its guidance, the Office of Information and Regulatory Affairs (“OIRA”) in the Office of Management and Budget (“OMB”) has emphasized that such techniques may include identifying changing future compliance costs that might result from technological innovation or anticipated behavioral changes. For the reasons stated in this preamble, this final regulatory action is consistent with these principles.

Section 6(a) of E.O. 12866 also requires agencies to submit “significant regulatory actions” to OIRA for review. OIRA has determined that this final regulatory action does not constitute a “significant regulatory action” under section 3(f) of E.O. 12866. Accordingly, this action was not submitted to OIRA for review under E.O. 12866.

#### *B. Review Under the Regulatory Flexibility Act*

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of a final regulatory flexibility analysis (FRFA) for any final rule where the agency was first required by law to publish a proposed rule for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, “Proper

Consideration of Small Entities in Agency Rulemaking,” 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003 to ensure that the potential impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel’s website: [www.energy.gov/gc/office-general-counsel](http://www.energy.gov/gc/office-general-counsel). DOE reviewed this final rule under the provisions of the Regulatory Flexibility Act and the procedures and policies published on February 19, 2003. DOE has concluded that this rule would not have a significant impact on a substantial number of small entities. The factual basis for this certification is as follows:

For manufacturers of dehumidifiers, the Small Business Administration (“SBA”) considers a business entity to be small business, if, together with its affiliates, it employs less than a threshold number of workers specified in 13 CFR part 121. DOE used SBA’s small business size standards to determine whether any small entities would be subject to the requirements of the rule. These size standards and codes are established by the North American Industry Classification System (“NAICS”) and are available at [www.sba.gov/document/support--table-size-standards](http://www.sba.gov/document/support--table-size-standards). Manufacturing of portable dehumidifiers is classified under NAICS 335210, “Small Electrical Appliance Manufacturing,” whereas the manufacturing of whole-home dehumidifiers is classified under NAICS 333415, “Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing.” The SBA sets a threshold of 1,500 employees or fewer and 1,250 employees or fewer for an entity to be considered as a small business in these industry categories, respectively.<sup>7</sup> For manufacturers of both portable and whole-home dehumidifiers, DOE used the higher (or more conservative) threshold of 1,500 employees or fewer.

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<sup>7</sup> U.S. Small Business Administration, “Table of Size Standards.” (Effective December 19, 2022). Available at [www.sba.gov/document/support-table-size-standards](http://www.sba.gov/document/support-table-size-standards) (last accessed January 23, 2023).

DOE used its Compliance Certification Database (“CCD”),<sup>8</sup> California Energy Commission's Modernized Appliance Efficiency Database System (“MAEDbS”),<sup>9</sup> and ENERGY STAR's Product Finder dataset<sup>10</sup> to create a list of companies that sell the products covered by this rulemaking in the United States. DOE then consulted publicly available data, such as manufacturer websites, manufacturer specifications and product literature, import/export logs, and basic model numbers, to identify original equipment manufacturers (“OEMs”) of the products covered by this rulemaking. DOE relied on public data and subscription-based market research tools (*e.g.*, Dun & Bradstreet reports<sup>11</sup>) to determine company location, headcount, and annual revenue. DOE screened out companies that do not offer products covered by this proposed rulemaking, do not meet the SBA's definition of a “small business,” or are foreign-owned and operated.

DOE identified 16 OEMs of dehumidifiers for the U.S. market. DOE estimates that 12 are OEMs of portable dehumidifiers, three are OEMs of whole-home dehumidifiers, and one is an OEM of both portable and whole-home dehumidifiers. Of the 16 total OEMs identified, one qualifies as a “small business” and is not foreign-owned or operated.

DOE did not receive any comments that specifically addressed impacts on small businesses or that were provided in response to the initial regulatory flexibility analysis.

In this final rule, DOE updates the existing test procedure for dehumidifiers by amending appendix X1 to incorporate the current version of the applicable industry standard, specify the dehumidification mode rating test period to be 2 hours, permit the use of a sampling tree in conjunction with an aspirating psychrometer or relative

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<sup>8</sup> U.S. Department of Energy, Compliance Certification Database. Available at [www.regulations.doe.gov/certification-data/#q=Product\\_Group\\_s%3A\\*](http://www.regulations.doe.gov/certification-data/#q=Product_Group_s%3A*) (last accessed October 11, 2022).

<sup>9</sup> California Energy Commission, Modernized Appliance Efficiency Database System. Available at: [cacertappliances.energy.ca.gov/Pages/Search/AdvancedSearch.aspx](http://cacertappliances.energy.ca.gov/Pages/Search/AdvancedSearch.aspx) (last accessed January 23, 2022).

<sup>10</sup> U.S. Environmental Protection Agency, ENERGY STAR Product Finder data set. Available at [www.energystar.gov/productfinder/](http://www.energystar.gov/productfinder/) (last accessed January 24, 2022).

<sup>11</sup> The Dun & Bradstreet Hoovers subscription login is available online at [app.dnbhoovers.com/](http://app.dnbhoovers.com/) (last accessed January 23, 2023).

humidity sensor for a dehumidifier with a single process air intake grille, and specify requirements for testing dehumidifiers with network functions. If the network functions can be disabled by the end-user and instructions to disable appear in the manual, test with those functions disabled; otherwise, test in the factory default setting. DOE has determined that these amendments would not increase testing costs. DOE has also determined that two amendments would likely reduce testing costs: shortening the test duration and permitting use of a sampling tree.

DOE has determined that the amendments in this final rule would not impact the measured energy use or representations of dehumidifier energy efficiency/energy use. DOE has also determined that manufacturers would be able to rely on data generated under the current test procedure as amended. As such, DOE does not expect retesting of any dehumidifier would be required solely as a result of DOE's adoption of these amendments to the test procedure.

Therefore, DOE concludes that the cost effects accruing from the final rule would not have a "significant economic impact on a substantial number of small entities," and that the preparation of a FRFA is not warranted. DOE has submitted a certification and supporting statement of factual basis to the Chief Counsel for Advocacy of the Small Business Administration for review under 5 U.S.C. 605(b).

### *C. Review Under the Paperwork Reduction Act of 1995*

Manufacturers of dehumidifiers must certify to DOE that their products comply with any applicable energy conservation standards. To certify compliance, manufacturers must first obtain test data for their products according to the DOE test procedures, including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including dehumidifiers. (*See generally* 10 CFR

part 429.) The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act (PRA). This requirement has been approved by OMB under OMB control number 1910-1400. Public reporting burden for the certification is estimated to average 35 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

DOE is not amending the certification or reporting requirements for dehumidifiers in this final rule.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB Control Number.

#### *D. Review Under the National Environmental Policy Act of 1969*

In this final rule, DOE establishes test procedure amendments that it expects will be used to develop and implement future energy conservation standards for dehumidifiers. DOE has determined that this rule falls into a class of actions that are categorically excluded from review under the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and DOE's implementing regulations at 10 CFR part 1021. Specifically, DOE has determined that adopting test procedures for measuring energy efficiency of consumer products and industrial equipment is consistent with activities identified in 10 CFR part 1021, appendix A to subpart D, A5 and A6. Accordingly, neither an environmental assessment nor an environmental impact statement is required.



#### *E. Review Under Executive Order 13132*

Executive Order 13132, “Federalism,” 64 FR 43255 (August 4, 1999), imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. The Executive order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE examined this final rule and determined that it will not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of this final rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297(d)) No further action is required by Executive Order 13132.

#### *F. Review Under Executive Order 12988*

Regarding the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, “Civil Justice Reform,” 61 FR 4729 (Feb. 7, 1996), imposes on Federal agencies the general duty to adhere to the following requirements: (1) eliminate drafting errors and ambiguity; (2) write regulations to minimize litigation; (3) provide a clear legal standard for affected conduct rather than a general standard; and (4) promote simplification and burden reduction. Section 3(b) of

Executive Order 12988 specifically requires that Executive agencies make every reasonable effort to ensure that the regulation (1) clearly specifies the preemptive effect, if any; (2) clearly specifies any effect on existing Federal law or regulation; (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction; (4) specifies the retroactive effect, if any; (5) adequately defines key terms; and (6) addresses other important issues affecting clarity and general draftsmanship under any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires Executive agencies to review regulations in light of applicable standards in sections 3(a) and 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, this final rule meets the relevant standards of Executive Order 12988.

*G. Review Under the Unfunded Mandates Reform Act of 1995*

Title II of the Unfunded Mandates Reform Act of 1995 (“UMRA”) requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Pub. L. 104-4, sec. 201 (codified at 2 U.S.C. 1531). For a regulatory action resulting in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of \$100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed “significant intergovernmental mandate,” and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing

any requirements that might significantly or uniquely affect small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at [www.energy.gov/gc/office-general-counsel](http://www.energy.gov/gc/office-general-counsel). DOE examined this final rule according to UMRA and its statement of policy and determined that the rule contains neither an intergovernmental mandate, nor a mandate that may result in the expenditure of \$100 million or more in any year, so these requirements do not apply.

#### *H. Review Under the Treasury and General Government Appropriations Act, 1999*

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105-277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This final rule will not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

#### *I. Review Under Executive Order 12630*

DOE has determined, under Executive Order 12630, “Governmental Actions and Interference with Constitutionally Protected Property Rights,” 53 FR 8859 (March 18, 1988), that this regulation will not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

#### *J. Review Under Treasury and General Government Appropriations Act, 2001*

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note), provides for agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. OMB’s guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE’s guidelines were published at 67 FR 62446 (Oct. 7, 2002). Pursuant to

OMB Memorandum M-19-15, Improving Implementation of the Information Quality Act (April 24, 2019), DOE published updated guidelines which are available at [www.energy.gov/sites/prod/files/2019/12/f70/DOE%20Final%20Updated%20IQA%20Guidelines%20Dec%202019.pdf](http://www.energy.gov/sites/prod/files/2019/12/f70/DOE%20Final%20Updated%20IQA%20Guidelines%20Dec%202019.pdf). DOE has reviewed this final rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

*K. Review Under Executive Order 13211*

Executive Order 13211, “Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,” 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OMB, a Statement of Energy Effects for any significant energy action. A “significant energy action” is defined as any action by an agency that promulgated or is expected to lead to promulgation of a final rule, and that (1) is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (3) is designated by the Administrator of OIRA as a significant energy action. For any significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use if the regulation is implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

This regulatory action is not a significant regulatory action under Executive Order 12866. Moreover, it would not have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as a significant energy action by the Administrator of OIRA. Therefore, it is not a significant energy action, and, accordingly, DOE has not prepared a Statement of Energy Effects.

*L. Review Under Section 32 of the Federal Energy Administration Act of 1974*

Under section 301 of the Department of Energy Organization Act (Pub. L. 95–91; 42 U.S.C. 7101), DOE must comply with section 32 of the Federal Energy Administration Act of 1974, as amended by the Federal Energy Administration Authorization Act of 1977. (15 U.S.C. 788; “FEAA”) Section 32 essentially provides in relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with the Attorney General and the Chairman of the Federal Trade Commission (“FTC”) concerning the impact of the commercial or industry standards on competition.

The modifications to the test procedure for dehumidifiers adopted in this final rule incorporates testing methods contained in certain sections of the following commercial standards: AHAM DH-1-2022, ANSI/AMCA 210, ANSI/ASHRAE 41.1, and IEC 62301. DOE has evaluated these standards and is unable to conclude whether it fully complies with the requirements of section 32(b) of the FEAA (*i.e.*, whether it was developed in a manner that fully provides for public participation, comment, and review.) DOE has consulted with both the Attorney General and the Chairman of the FTC about the impact on competition of using the methods contained in these standards and has received no comments objecting to their use.

*M. Congressional Notification*

As required by 5 U.S.C. 801, DOE will report to Congress on the promulgation of this rule before its effective date. The report will state that it has been determined that the rule is not a "major rule" as defined by 5 U.S.C. 804(2).

#### *N. Description of Materials Incorporated by Reference*

AHAM DH-1-2022 is an industry-accepted test procedure that measures the capacity and energy input of portable dehumidifiers under specified test conditions. AHAM DH-1-2022 includes provisions for testing dehumidifier energy use in off-cycle, inactive, and off modes, and for including energy consumption in those modes in efficiency calculations. Appendix X1 references sections of AHAM DH-1-2022 for definitions, instrumentation, and test procedure requirements. AHAM DH-1-2022 is reasonably available from AHAM at [www.aham.org/AHAM/AuxStore](http://www.aham.org/AHAM/AuxStore).

The following standards appear in the amendatory text of this document and were previously approved for the locations in which they appear: ANSI/AMCA 210, ANSI/ASHRAE 41.1, and IEC 62301.

### **V. Approval of the Office of the Secretary**

The Secretary of Energy has approved publication of this final rule.

#### **List of Subjects in 10 CFR Part 430**

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Imports, Incorporation by reference, Intergovernmental relations, Small businesses.

#### **Signing Authority**

This document of the Department of Energy was signed on July 11, 2023, by Francisco Alejandro Moreno, Acting Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes

only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on July 11, 2023.

Treena V. Garrett,  
Federal Register Liaison Officer,  
U.S. Department of Energy.

For the reasons stated in the preamble, DOE amends part 430 of Chapter II of Title 10, Code of Federal Regulations as set forth below:

## **PART 430 -- ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS**

1. The authority citation for part 430 continues to read as follows:

**Authority:** 42 U.S.C. 6291-6309; 28 U.S.C. 2461 note.

2. Section 430.2 is amended by revising the definitions of “Portable dehumidifier” and “Whole-home dehumidifier” to read as follows:

### **§430.2 Definitions.**

\* \* \* \* \*

*Portable dehumidifier* means a dehumidifier that, in accordance with any manufacturer instructions available to a consumer, operates within the dehumidified space without the attachment of additional ducting, although means may be provided for optional duct attachment.

\* \* \* \* \*

*Whole-home dehumidifier* means a dehumidifier that, in accordance with any manufacturer instructions available to a consumer, operates with ducting to deliver return process air to its inlet and to supply dehumidified process air from its outlet to one or more locations in the dehumidified space.

3. Section 430.3 is amended by:

- a. Removing the words “http://” and “[https://](#)” wherever they appear;
- b. Revising paragraphs (a) and (i)(3);
- c. Removing paragraph (o)(2);
- d. Redesignating paragraphs (o)(3) and (4) as paragraphs (o)(2) and (3), respectively;



e. Revising paragraph (q)(6); and

f. Redesignating paragraph (q)(9) as paragraph (q)(8).

The revisions read as follows:

**§430.3 Materials incorporated by reference.**

(a) Certain material is incorporated by reference into this part with the approval of the Director of the Federal Register under 5 U.S.C. 552(a) and 1 CFR part 51. To enforce any edition other than that specified in this section, the U.S. Department of Energy (DOE) must publish a document in the Federal Register and the material must be available to the public. All approved incorporation by reference (IBR) material is available for inspection at the Department of Energy (DOE) and at the National Archives and Records Administration (NARA). Contact DOE at: The U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE-5B, 1000 Independence Avenue, SW, Washington, DC 20585-0121, (202) 586-9127, [Buildings@ee.doe.gov](mailto:Buildings@ee.doe.gov), [www.energy.gov/eere/buildings/appliance-and-equipment-standards-program](http://www.energy.gov/eere/buildings/appliance-and-equipment-standards-program). For information on the availability of this material at NARA, visit [www.archives.gov/federal-register/cfr/ibr-locations.html](http://www.archives.gov/federal-register/cfr/ibr-locations.html) or email [fr.inspection@nara.gov](mailto:fr.inspection@nara.gov). The material may be obtained from the sources in the following paragraphs of this section.

\* \* \* \*

(i) \* \*

(3) AHAM DH-1-2022, *Energy Measurement Test Procedure for Dehumidifiers*, copyright 2022; IBR approved for appendix X1 to subpart B.

\* \* \* \*

(q) \* \*

(6) IEC 62301 (“IEC 62301”), *Household electrical appliances - Measurement of standby power*, (Edition 2.0, 2011-01); IBR approved for appendices C1, C2, D1, D2, F, G, I, I1, J, J2, N, O, P, Q, U, X1, Y, Y1, Z, BB, CC, CC1, EE, and FF to subpart B.

\* \* \* \* \*

4. Section 430.23 is amended by revising paragraph (z) to read as follows:

**§430.23 Test procedures for the measurement of energy and water consumption.**

\* \* \* \* \*

(z) *Dehumidifiers*. (1) Determine the capacity, expressed in pints/day, according to section 5.2 of appendix X1 to this subpart.

(2) Determine the integrated energy factor, expressed in L/kWh, according to section 5.4 of appendix X1 to this subpart.

(3) Determine the case volume, expressed in cubic feet, for whole-home dehumidifiers in accordance with section 5.7 of appendix X1 of this subpart.

\* \* \* \* \*

**Appendix X to Subpart B of Part 430 [Removed and Reserved]**

5. Remove and reserve appendix X to subpart B of part 430.

6. Amend Appendix X1 to subpart B of part 430 by:

- a. Revising the introductory note;
- b. Adding section 0;
- c. Revising sections 2 and 3.1.1;
- d. Removing section 3.1.1.2;
- e. Redesignating sections 3.1.1.3 through 3.1.1.6 as sections 3.1.1.2 through 3.1.1.5;
- f. Revising newly redesignated sections 3.1.1.2 and 3.1.1.4;
- g. Revising sections 3.1.2, 3.1.2.2.3.1, 3.1.2.2.3.2, 3.1.2.3, 3.2.2.1, 4.1.1, 4.1.2, 4.2, and 4.3;
- h. Removing sections 4.3.1 and 4.3.2; and

i. Revising section 5.4.

The revisions and additions read as follows:

**Appendix X1 to Subpart B of Part 430– Uniform Test Method for Measuring the Energy Consumption of Dehumidifiers**

**Note:** After [INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*], any representations made with respect to the energy efficiency of a dehumidifier must be made in accordance with the results of testing pursuant to this appendix. Manufacturers conducting tests of a dehumidifier prior to [INSERT DATE 180 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*], must conduct such test in accordance with either this appendix or the previous version of this appendix as it appeared in the Code of Federal Regulations on January 1, 2023. Any representations made with respect to the energy efficiency of such dehumidifier must be in accordance with whichever version is selected.

*0. Incorporation by Reference*

DOE incorporated by reference in §430.3, the entire standard for AHAM DH-1-2022, ANSI/AMCA 210, ANSI/ASHRAE 41.1, and IEC 62301; however, only enumerated provisions of those documents are applicable to this appendix. To the extent there is a conflict between the terms or provisions of a referenced industry standard and the CFR, the CFR provisions control.

0.1 AHAM DH-1-2022

- (a) Section 3 “Definitions”, as specified in sections 2 and 3.1.2 of this appendix.
- (b) Section 4 “Instrumentation”, as specified in sections 3.1.1 and 3.1.2 of this appendix.
- (c) Section 5.1 “General”, as specified in sections 3.1.1 and 3.1.2 of this appendix.
- (d) Section 5.2 “Test Room”, as specified in sections 3.1.1 and 3.1.2 of this appendix.
- (e) Section 5.3 “Positioning of Test Unit”, as specified in sections 3.1.1 and 3.1.1.2 of this appendix.
- (f) Section 5.5 “Control settings”, as specified in sections 3.1.1, 3.1.1.4, and 3.1.2 of this appendix.

- (g) Section 7 “Test Tolerances”, as specified in section 4.1.1 of this appendix.
- (h) Section 8 “Capacity Test”, as specified in sections 4.1.1 and 4.1.2 of this appendix.
- (i) Section 8.3 “Standard Test Voltage”, as specified in section 3.2.2.1 of this appendix.
- (j) Section 8.4 “Psychrometer Placement”, as specified in section 3.1.1.2 of this appendix.
- (k) Section 9 “Energy Consumption”, as specified in sections 4.1.1 and 4.1.2 of this appendix.
- (l) Section 9.3.2 “Inactive/Off Mode”, as specified in section 4.2 of this appendix.
- (m) Section 9.3.1 “Off-Cycle Mode”, as specified in section 4.3 of this appendix.
- (n) Section 9.4 “Calculation of Test Results”, as specified in section 4.1.2 of this appendix.

## 0.2 ANSI/AMCA 210

- (a) Section 5.2.1.6 “Airflow straightener”, as specified in section 3.1.2.1 of this appendix.
- (b) Figure 6A “Flow Straightener – Cell Type”, as specified in section 3.1.2.1 of this appendix.
- (c) Section 4.2.2 “Pitot-static tube”, as specified in section 3.1.2.2.3.1 of this appendix.
- (d) Section 4.2.3 “Static pressure tap”, as specified in section 3.1.2.2.3.1 of this appendix.
- (e) Section 4.3.1 “Pitot Traverse”, as specified in section 3.1.2.2.3.1 of this appendix.
- (f) Section 4.3.2 “Flow nozzle”, as specified in section 3.1.2.2.3.1 of this appendix.

(g) Section 7.5.2 “Pressure Losses”, as specified in section 3.1.2.2.3.1 of this appendix.

(h) Section 7.3.1 “Velocity Traverse”, as specified in section 3.1.2.2.3.2 of this appendix.

(i) Section 7.3.2 “Nozzle”, as specified in section 3.1.2.2.3.2 of this appendix.

(j) Section 7.3 “Fan airflow rate at test conditions”, as specified in section 5.6 of this appendix.

#### 0.3 ANSI/ASHRAE 41.1

(a) Section 5.3.5 “Centers of Segments – Grids”, as specified in section 3.1.2.2.1 of this appendix.

(b) [Reserved]

#### 0.4 IEC 62301

(a) Section 5.2 “Preparation of product”, as specified in section 3.2.1 of this appendix.

(b) Section 4.3.2 “Supply voltage waveform”, as specified in section 3.2.2.2 of this appendix.

(c) Section 4.4 “Power measuring instruments”, as specified in section 3.2.3 of this appendix.

(d) Section 4.2 “Test room”, as specified in section 3.2.4 of this appendix.

\* \* \* \* \*

## 2. Definitions

Definitions for terms, modes, calculations, etc. are in accordance with AHAM DH-1-2022, section 3, with the following added definitions:

*Energy factor for dehumidifiers* means a measure of energy efficiency of a dehumidifier

calculated by dividing the water removed from the air by the energy consumed, measured in liters per kilowatt-hour (L/kWh).

*External static pressure (ESP)* means the process air outlet static pressure minus the process air inlet static pressure, measured in inches of water column (in. w.c.).

*Process air* means the air supplied to the dehumidifier from the dehumidified space and discharged to the dehumidified space after some of the moisture has been removed by means of the refrigeration system.

*Product capacity* for dehumidifiers means a measure of the ability of the dehumidifier to remove moisture from its surrounding atmosphere, measured in pints collected per 24 hours of operation under the specified ambient conditions.

*Product case volume* for whole-home dehumidifiers means a measure of the rectangular volume that the product case occupies, exclusive of any duct attachment collars or other external components.

*Reactivation air* means the air drawn from unconditioned space to remove moisture from the desiccant wheel of a refrigerant-desiccant dehumidifier and discharged to unconditioned space.

\* \* \* \* \*

3.1 \* \* \*

3.1.1 *Portable dehumidifiers and whole-home dehumidifiers other than refrigerant-desiccant dehumidifiers.* The test apparatus and instructions for testing in dehumidification mode and off-cycle mode must conform to the requirements specified in Section 4, “Instrumentation,” section 5.1, “General,” section 5.2, “Test Room,” Section 5.3, “Positioning of Test Unit,” and section 5.5, “Control settings” of AHAM DH-1-2022, with the following exceptions. If a product is able to operate as either a portable or whole-home dehumidifier by means of removal or installation of an optional ducting kit, in accordance with any manufacturer instructions available to a consumer,

test and rate both configurations.

\* \* \* \* \*

3.1.1.2 *Instrumentation placement.* If using a sampling tree, follow the instrumentation placement instructions in sections 5.3 and 8.4 of AHAM DH-1-2022. If not using a sampling tree, place the aspirating psychrometer or relative humidity and dry-bulb temperature sensors perpendicular to, and 1 ft. in front of, the center of the process air intake grille. During each test, use the psychrometer or relative humidity and dry-bulb sensors to monitor inlet conditions of only one unit under test. When using relative humidity and dry-bulb temperature sensors without sampling trees to test a unit that has multiple process air intake grilles, place a relative humidity sensor and dry-bulb temperature sensor perpendicular to, and 1 ft. in front of, the center of each process air intake grille.

\* \* \* \* \*

3.1.1.4 *Control settings.* Follow the control settings instructions in section 5.5 of AHAM DH-1-2022.

\* \* \* \* \*

3.1.2 *Refrigerant-desiccant dehumidifiers.* The test apparatus and instructions for testing refrigerant-desiccant dehumidifiers in dehumidification mode must conform to the requirements specified in section 3, “Definitions,” section 4, “Instrumentation,” and section 5.1, “General,” section 5.2, “Test Room,” and section 5.5, “Control settings,” of AHAM DH-1-2022, except as follows.

\* \* \* \* \*

3.1.2.2.3.1 *External static pressure.* Measure static pressures in each duct using pitot-static tube traverses, a flow nozzle or a bank of flow nozzles. For pitot-static tube traverses, conform to the specifications in section 4.3.1, “Pitot Traverse,” of ANSI/AMCA 210 and section 4.2.2, “Pitot-Static Tube,” of ANSI/AMCA 210, except

use only two intersecting and perpendicular rows of pitot-static tube traverses. For a flow nozzle or bank of flow nozzles, conform to the specifications in section 4.3.2, “Flow nozzle,” of ANSI/AMCA 210 and section 4.2.3, “Static pressure tap” of ANSI/AMCA 210. Record the static pressure within the test duct as follows. When using pitot-static tube traverses, record the pressure as measured at the pressure tap in the manifold of the traverses that averages the individual static pressures at each pitot-static tube. When using a flow nozzle or bank of nozzles, record the pressure or in accordance with section 4.2.3.2, “Averaging,” of ANSI/AMCA 210. Calculate duct pressure losses between the unit under test and the plane of each static pressure measurement in accordance with section 7.5.2, “Pressure Losses,” of ANSI/AMCA 210. The external static pressure is the difference between the measured inlet and outlet static pressure measurements, minus the sum of the inlet and outlet duct pressure losses. For any port with no duct attached, use a static pressure of 0.00 in. w.c. with no duct pressure loss in the calculation of external static pressure. During dehumidification mode testing, the external static pressure must equal 0.20 in. w.c.  $\pm$  0.02 in. w.c.

3.1.2.2.3.2 *Velocity pressure.* Measure velocity pressures using the same pitot traverses or nozzles as used for measuring external static pressure, which are specified in section 3.1.2.2.3.1 of this appendix. When using pitot-static tube traverses, determine velocity pressures at each pitot-static tube in a traverse as the difference between the pressure at the impact pressure tap and the pressure at the static pressure tap and calculate volumetric flow rates in each duct in accordance with section 7.3.1, “Velocity Traverse,” of ANSI/AMCA 210. When using a flow nozzle or a bank of flow nozzles, calculate the volumetric flow rates in each duct in accordance with section 7.3.2, “Nozzle,” of ANSI/AMCA 210.

\* \* \* \* \*

3.1.2.3 *Control settings.* Follow the control settings instructions in section 5.5 of AHAM



DH-1-2022.

\* \* \* \* \*

3.2.2 \* \* \*

3.2.2.1 *Electrical supply*. For the inactive mode and off mode testing, maintain the electrical supply voltage and frequency indicated in section 8.3, “Standard Test Voltage,” of AHAM DH-1-2022. The electrical supply frequency shall be maintained  $\pm 1$  percent.

\* \* \* \* \*

4.1 \* \* \*

4.1.1 *Portable dehumidifiers and whole-home dehumidifiers other than refrigerant-desiccant dehumidifiers*. Measure the energy consumption in dehumidification mode, EDM, in kilowatt-hours (kWh), the average percent relative humidity, Ht, either as measured using a relative humidity sensor or using Tables 2 and 3 when using an aspirating psychrometer, and the product capacity, Ct, in pints per day (pints/day), in accordance with the test requirements specified in section 7, “Test Tolerances,” section 8, “Capacity Test,” and section 9, “Energy Consumption,” of AHAM DH-1-2022, with two exceptions. First, the rating test period must be 2 hours. Second, maintain the standard test conditions as shown in Table 1.

**Table 1 to Paragraph 4.1.1.: Standard Test Conditions for Dehumidifier Testing.**

Configuration	Dry-bulb Temperature (°F)	Aspirating Psychrometer Wet-bulb Temperature (°F)	Relative Humidity Sensor Relative Humidity (%)
Portable dehumidifiers	$65 \pm 2.0$	$56.6 \pm 1.0$	$60 \pm 2$
Whole-home dehumidifiers	$73 \pm 2.0$	$63.6 \pm 1.0$	$60 \pm 2$

When using relative humidity and dry-bulb temperature sensors, for dehumidifiers with multiple process air intake grilles, average the measured relative humidities and average the measured dry-bulb temperatures to determine the overall intake air conditions.

**Table 2 to Paragraph 4.1.1.: Relative Humidity as a Function of Dry-Bulb and Wet-Bulb Temperatures for Portable Dehumidifiers**

Wet-Bulb temperature (°F)	Dry-Bulb temperature (°F)										
	64.5	64.6	64.7	64.8	64.9	65	65.1	65.2	65.3	65.4	65.5
56.3	60.32	59.94	59.57	59.17	58.8	58.42	58.04	57.67	57.3	56.93	56.56
56.4	60.77	60.38	60	59.62	59.24	58.86	58.48	58.11	57.73	57.36	56.99
56.5	61.22	60.83	60.44	60.06	59.68	59.3	58.92	58.54	58.17	57.8	57.43
56.6	61.66	61.27	60.89	60.5	60.12	59.74	59.36	58.98	58.6	58.23	57.86
56.7	62.4	61.72	61.33	60.95	60.56	60.18	59.8	59.42	59.04	58.67	58.29
56.8	62.56	62.17	61.78	61.39	61	60.62	60.24	59.86	59.48	59.1	58.73
56.9	63.01	62.62	62.23	61.84	61.45	61.06	60.68	60.3	59.92	59.54	59.16

**Table 3 to Paragraph 4.1.1.: Relative Humidity as a Function of Dry-Bulb and Wet-Bulb Temperatures for Whole-Home Dehumidifiers**

Wet-Bulb temperature (°F)	Dry-Bulb temperature (°F)										
	72.5	72.6	72.7	72.8	72.9	73	73.1	73.2	73.3	73.4	73.5
63.3	60.59	60.26	59.92	59.59	59.26	58.92	58.6	58.27	57.94	57.62	57.3
63.4	60.98	60.64	60.31	59.75	59.64	59.31	58.98	58.65	58.32	58	57.67
63.5	61.37	61.03	60.7	60.36	60.02	59.69	59.36	59.03	58.7	58.38	58.05
63.6	61.76	61.42	61.08	60.75	60.41	60.08	59.74	59.41	59.08	58.76	58.43
63.7	62.16	61.81	61.47	61.13	60.8	60.46	60.13	59.8	59.47	59.14	58.81
63.8	62.55	62.2	61.86	61.52	61.18	60.85	60.51	60.18	59.85	59.52	59.19
63.9	62.94	62.6	62.25	61.91	61.57	61.23	60.9	60.56	60.23	59.9	59.57

4.1.2 *Refrigerant-desiccant dehumidifiers*. Establish the testing conditions set forth in section 3.1.2 of this appendix. Measure the energy consumption, EDM, in kWh, in accordance with the test requirements specified in section 8, “Capacity Test,” and section 9, “Energy Consumption,” respectively, of AHAM DH-1-2022, with the following exceptions and adjustments:

- (a) Each measurement of the temperature and relative humidity of the air entering the process air inlet duct and the reactivation air inlet must be within 73 °F ± 2.0 °F dry-bulb temperature and 60 percent ± 5 percent relative humidity, and the arithmetic average of the inlet test conditions over the test period shall be within 73 °F ± 0.5 °F dry-bulb

temperature and 60 percent  $\pm$  2 percent relative humidity;

(b) Disregard the instructions for psychrometer placement;

(c) Record dry-bulb temperatures, relative humidities, static pressures, velocity pressures in each duct, volumetric air flow rates, and the number of measurements in the test period;

(d) Disregard the requirement to weigh the condensate collected during the test;

(e) The rating test period must be 2 hours; and

(f) To perform the calculations in section 9.4, “Calculation of Test Results,” of AHAM DH-1-2022:

(i) Replace “Condensate collected (lb)” and “mlb”, with the weight of condensate removed, W, as calculated in section 5.6 of this appendix; and

(ii) Use the recorded relative humidities, not the tables in section 4.1.1 of this appendix, to determine average relative humidity.

4.2 *Off-cycle mode*. Follow requirements for test measurement in off-cycle mode of operation in accordance with section 9.3.2 of AHAM DH-1-2022.

4.3 *Inactive and off mode*. Follow requirements for test measurement in inactive and off modes of operation in accordance with section 9.3.1 of AHAM DH-1-2022.

\* \* \* \* \*

5. \* \* \*

5.4 *Integrated energy factor*. Calculate the integrated energy factor, IEF, in L/kWh, rounded to two decimal places, according to the following:

$$IEF = \frac{\left(C_r \times \frac{2 \times 1.04}{24}\right) \times 0.454}{\left[E_{DM} + \left(\left(\frac{E_{TLP}}{1095}\right) \times 2\right)\right]}$$

Where:

C<sub>r</sub> = corrected product capacity in pints per day, as determined in section 5.2 of this

appendix;

2 = dehumidification mode test duration in hours;

$E_{DM}$  = energy consumption during the 2-hour dehumidification mode test in kWh, as measured in section 4.1 of this appendix;

$E_{TLP}$  = annual combined low-power mode energy consumption in kWh per year, as calculated in section 5.3 of this appendix;

1,095 = dehumidification mode annual hours, used to convert  $E_{TLP}$  to combined low-power mode energy consumption per hour of dehumidification mode;

1.04 = the density of water in pounds per pint;

0.454 = the liters of water per pound of water; and

24 = the number of hours per day.

\* \* \* \* \*